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TEACHING ADULTS BY TELEVISION, A REPORT OF AN EXPERIMENT IN THE TEACHING OF ELEMENTARY ENGLISH AND ARITHMETIC TO ADULT AFRICANS ON THE COPPERBELT, ZAMBIA, 1963-1965.

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DESCRIPTORS- *CLOSED CIRCUIT TELEVISION, *INSERVICE TEACHER EDUCATION, CONVENTIONAL INSTRUCTION, STATISTICAL ANALYSIS, *ADULT BASIC EDUCATION, *ENGLISH (SECOND LANGUAGE), *TEACHING METHODS, ARITHMETIC, RHOKANA, ANGLO AMERICAN CORPORATION, ROAN SELECTION TRUST

THREE EXPERIMENTS WERE DESIGNED TO TEACH ADULT MEN WITH LIMITED EDUCATION A CLOSED-CIRCUIT TELEVISIED COURSE IN ENGLISH AND ARITHMETIC, TO BE REINFORCED BY CONVENTIONAL CLASSROOM INSTRUCTION. BACKGROUND AND GENERAL PROCEDURES OF THE EXPERIMENTS ARE DESCRIBED, AND STATISTICAL DATA REPORTED FOR COMPARISONS ON ABILITY BEFORE AND AFTER INSTRUCTION AMONG EXPERIMENTAL SAMPLES MATCHED ON SOME VARIABLES TO A CONTROL GROUP. RESULTS (SOME STATISTICALLY SIGNIFICANT) THAT ADULTS APPEARED TO LEARN AT LEAST AS FAST BY TV AS IN A CONVENTIONAL CLASSROOM, ARE DISCUSSED ALONG WITH POSSIBLE DESIGN AND SAMPLING ERRORS. (LH)

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TEACHING ADULTS BY TELEVISION

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FACULTY OF EDUCATION - OCCASIONAL PAPER No. 6

TEACHING ADULTS BY TELEVISION

A report of an experiment in the teaching
of elementary English and Arithmetic to
adult Africans on the Copperbelt, Zambia.

1963 - 1965.

by

KENNETH K. R. CRIPWELL

To Wilbur Schramm
in appreciation
Kenneth Cripwell

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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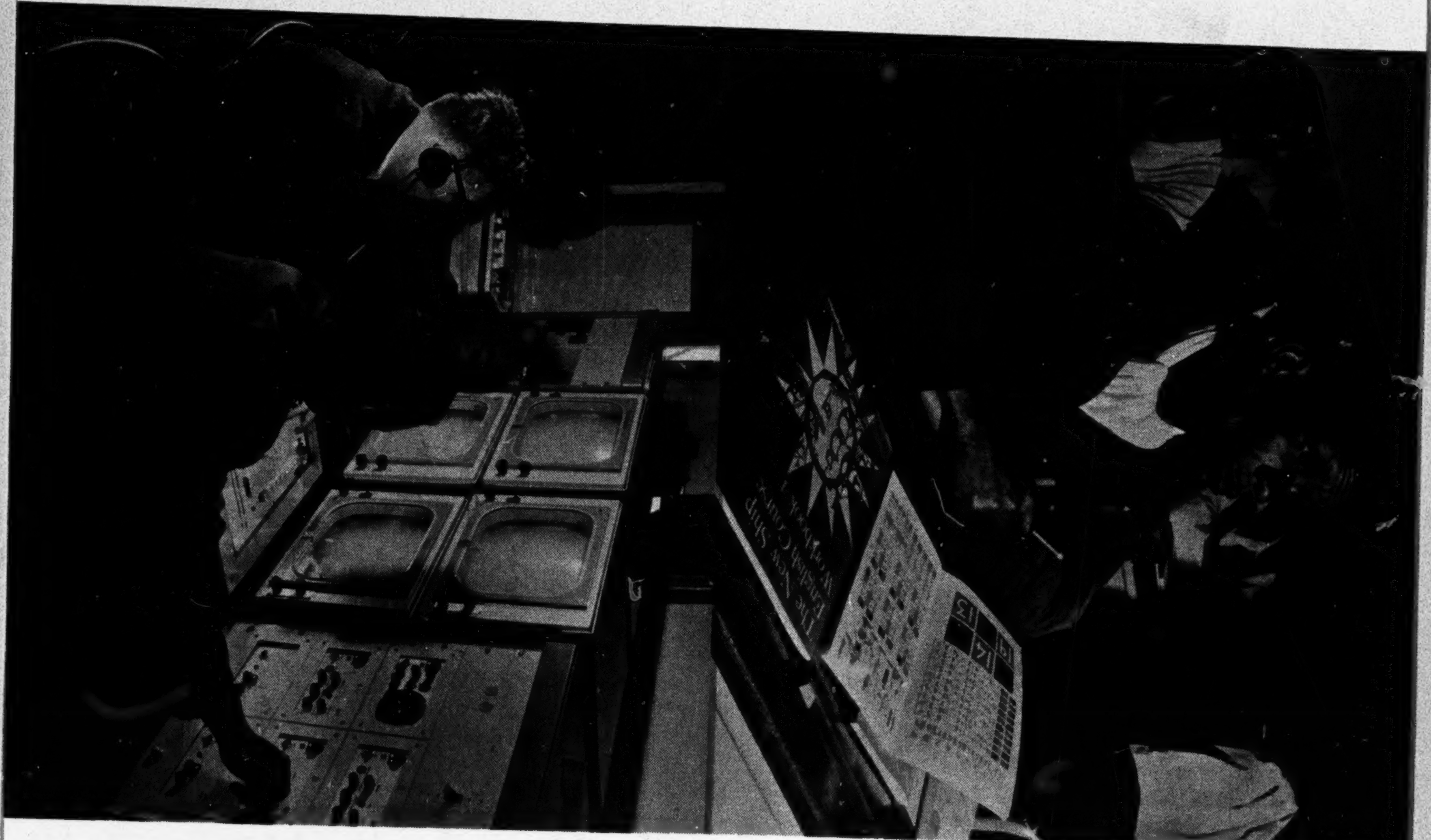
UNIVERSITY COLLEGE OF RHODESIA, SALISBURY.
1966


The New Ship
English Course
Workbook 1

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Kenneth Campbell

PREFACE

The work covered by this Occasional Paper, and the publication of the paper itself, were made possible in the first place by the Anglo American Corporation and Roan Selection Trust Limited, who financed the project. Rhokana Corporation, a Company in the Anglo American Corporation, provided the buildings and other services used in the project, and Messrs. John Kemp, David Hagen, John Chadwick, and Bert Carroll, members of the Rhokana Corporation staff, were particularly interested in the project and helpful to me personally. To these Companies and individuals I would like to express my sincere thanks.

In my work on the project I was, as a Research Fellow of the Institute of Adult Education at the University College of Rhodesia and Nyasaland, able to obtain advice and assistance from my colleagues in the College. For their help during the project I should like to thank Mr. E.K. Townsend Coles, then Director of the Institue of Adult Education, Dr. David Hawkridge, Professors Cyril Rogers and Alan Milton, and Mr. Hayden Roberts.

I am especially indebted to two other members of the University staff: to Mrs. Thelma Henderson for editing Part I of the paper, and to Mr. D.D. Russell for editing Part II of the paper on the basis of a research outline and data provided by me.

Finally, I would like to acknowledge the co-operation of Messrs. Longmans, Green & Co., Ltd, in giving permission for me to use the New Ship English Course as the basis for the English language part of the project and to adapt it for the purpose of the project.

KENNETH K.R. CRIPWELL.

employees can gain higher qualifications which are needed if they are to gain promotion.

One of the most important subjects taught in all classes is English. In September, 1960, for instance, the Roan Antelope Adult Education Centre alone reported that 589 employees were taking classes in elementary English (Roan Antelope 1960). English is the official language of Zambia, a country in which eighteen different languages are spoken. Each of these languages is divided into dialects, and a speaker of one dialect may be unintelligible even to those who speak different dialects of his own language. The situation on the Copperbelt is made even more complex by the arrival not only of people from all parts of Zambia, but also of large numbers from the Congo, Malawi, Mozambique, Angola and Tanzania (Mitchell 1954). For these people, living together in a polyglot society, a second language is needed as a means of general communication in the community at large, in education and at work at all levels. To some extent, a man's survival, usefulness and progress within this society depends on his knowledge of English.

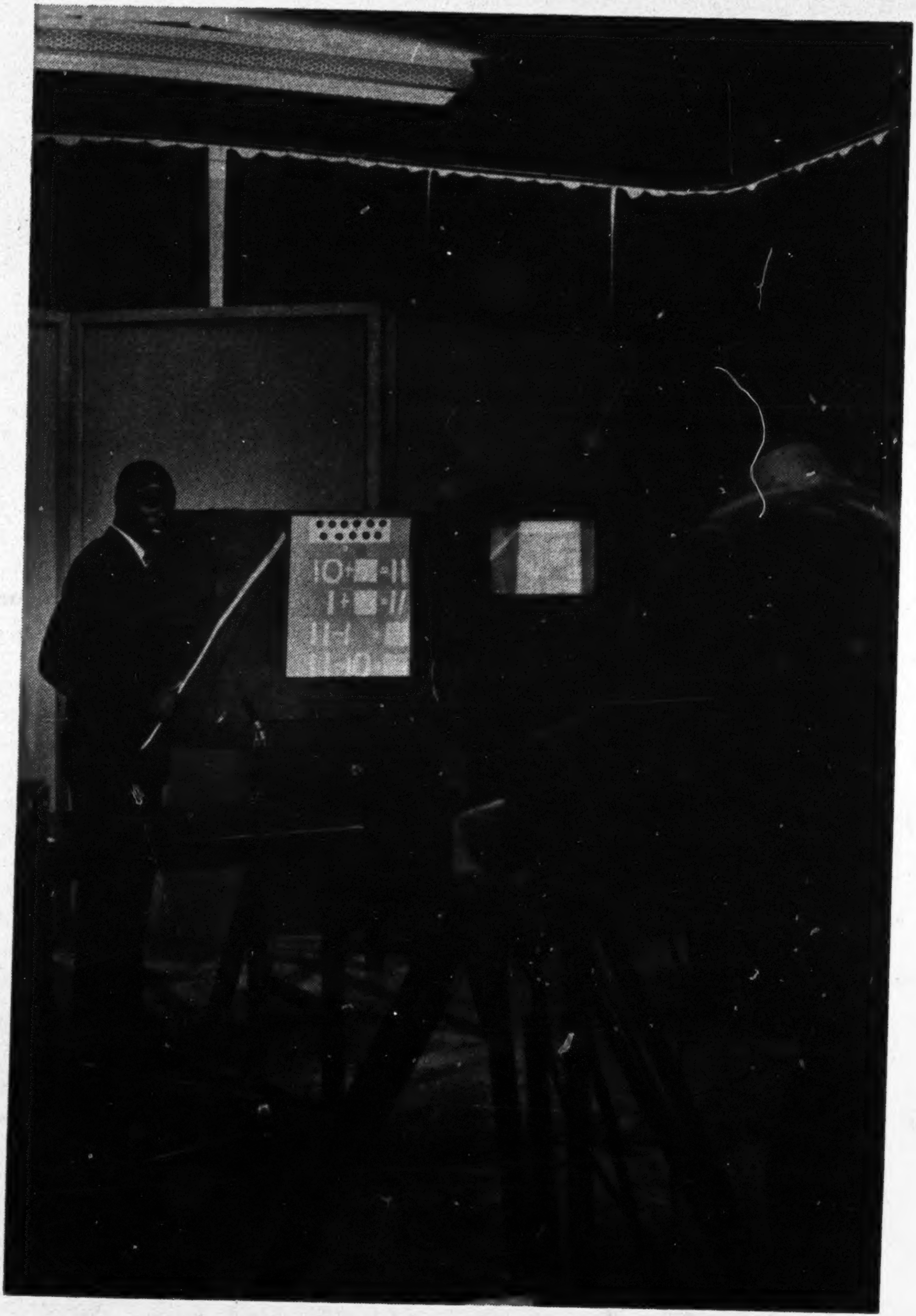
During the 1950s the Copper Companies became even more deeply committed to education. Federation in 1953 had brought with it a boom which was accompanied by a feeling of optimism and a realisation that more money and effort must be invested in African education and advancement. In adult education, the late 1950s was a time of ferment. New men were being employed by the mines to develop educational facilities, and they found that there were many problems to be solved. For instance, how could more teachers be provided for an increasing number of students in a teacher-starved area? What was the most suitable textbook for teaching English to adults in an industrial urban environment? How could students who were scattered over the wide area of the mine be brought together quickly at convenient times? How could students learn more in a shorter time? Increasingly, the solution to these problems seemed to lie in the adoption of new educational techniques such as programming, language laboratories and television. Of these television had caught the imagination as a means of teaching large numbers of people in many different places quickly and well.

At about this time, in December, 1961, the first International Conference of Radio and Television Organisations on School Broadcasting was held in Rome. Mr. E. K. Townsend Coles of the Institute of Adult Education, University College of Rhodesia and Nyasaland, was invited to attend and his journey was financed by the Anglo American Corporation and the Rhodesian Selection Trust, who were interested in finding out about the use of television in language teaching and about the advantages and disadvantages of closed-circuit television.

In February, 1962, Mr. Townsend Coles produced a report in which he outlined how television had been used to teach languages and in particular how Educational Television in Italy (Telescuola) had been used to teach adults of limited education. He listed the advantages of closed and open-circuit transmission and recommended that television should be used in education in Central Africa. This report served to underline the Copper Companies' interest in television as a means of overcoming some of their own educational difficulties.

It was then suggested that a two-year research project should be undertaken on the Copperbelt. The aim of this project would be to find out how to produce successful programmes for African children and adults living in an industrial urban environment; and to evaluate these programmes and any other educational material being transmitted. The person appointed to undertake the research would be connected with the Institute of Adult Education, University College of Rhodesia & Nyasaland, and would also be associated with the Rhodes-Livingstone Institute, Lusaka (now the Institute for Social Research, University of Zambia), which would bring him into contact with the work already done on communications and mass media. It was hoped that the commercial station at Kitwe would allow facilities for transmission.

The aim of the research underwent several refinements before the experiments began. When Mr. K.K.R. Cripwell was appointed Research Fellow in Educational Television by the University College of Rhodesia & Nyasaland in December, 1962, it was decided that the field of investigation should be limited to finding out about the ways in which English could be taught by television to adults of less than three years formal education, who normally studied in conventional classes at the Adult Education Centres on the Copperbelt. Another subject, Arithmetic, was later added at the request of the students who felt that an ability to deal with numbers is important in a society where money is the basis of economic transactions. Their demand for numeracy as well as literacy was also strongly motivated by the desire for advancement which could be achieved by passing the official examinations set by the Zambian Ministry of Education. These examinations, which come at the end of primary



INTRODUCTION

In May 1962, the Anglo American Corporation of Central Africa and the Rhodesian (now Roan) Selection Trust, generously made available £10,000 to enable an experiment on the use of television in the teaching of adults of limited education to be undertaken on the Copperbelt. Fifteen months later in August, 1963, an extra sum of money was given to equip a television studio. The introduction to this report will attempt to answer four main questions. First, why were these two Copper Companies interested in giving money for an educational project? Second, why did they decide to make money available at that particular time? Third, what was the aim of this project? Last, what form did it take?

The Copper Companies have a long history of interest in education. Since 1931, when the first copper was exported, the Copperbelt has changed from a sparsely populated bushland to a large industrial complex. Increasingly large numbers of Africans have been attracted by the relatively high wages, and many of them, although at first intending to stay only a few years, have remained and now form a largely permanent labour force (Mitchell 1951). This has been of advantage to the Copper Companies, and they have encouraged their employees to remain by providing services such as education. Schools have been built in the mining townships for their employees' children. Adult education classes have been provided on the mines for the employees themselves.

At the Adult Education Centres both compulsory induction and training courses and voluntary classes have been provided. Induction and training courses were necessary because of the nature of the labour force. At the beginning, the men entering the mine had had no previous education and no experience of mining. They needed to be able to understand their jobs and the way in which these fitted in with the general pattern of work in the mine. They needed to be able to recognise hazards and to learn how to avoid them. Training and induction courses were arranged to supply these needs and thereby encourage greater efficiency and confidence and greater safety.

Alongside the compulsory courses, voluntary classes have grown up for both the men and their wives. The syllabus followed is the conventional syllabus for schools laid down by the Northern Rhodesian (now Zambian) Ministry of Education. Students who join the voluntary classes take the examinations set by the Ministry. This is a way of beginning or continuing formal education. It provides a way in which school, are in English, Arithmetic, and Social Science, and from the point of view of promotion in the mines the first two are the most important. The aim of the project therefore eventually became to attempt to teach both elementary English and Arithmetic in an integrated course by television to groups of adult men employed by the Copper Mines.

When it was realised that it would be impossible to use the commercial station at Kitwe a new studio full of equipment was needed, at a cost higher than the £1,500 originally granted for equipment. Accommodation was provided by the Anglo American Corporation at Rhokana, and a further grant was made for the purchase of closed-circuit equipment.

One of the Research Fellow's first tasks was to supervise the equipping of the studio and to select and train the studio team. At the same time, because the television project was expected to fit into the existing adult education system, he was expected to visit the Adult Education Centres run by the Anglo American Corporation at Nchanga, Rhokana and Bancroft, and those run by the Rhodesian Selection Trust at Mufulira, Chibuluma, and Roan Antelope to find out about the courses, methods and materials they were using. The most important of these investigations were made at Rhokana Corporations at Kitwe where the Television Centre was to be established.

The aims of the investigations were several. An English and Arithmetic course had to be found which could be used as the basis of the television lessons and which could be used for comparative purposes in the classroom of at least one of the Adult Education Centres. The Research Fellow needed to know what methods and what visual aids were being used in the classroom. Finally, he wanted to observe the standard of teaching because the television teachers were to be selected from the classroom teachers.

By the beginning of July, 1964, the Television Centre was established. Mr. Shamatutu and Mr. Kapihya had been selected to produce English and Arithmetic broadcasts. The New Ship English Course and My Second Number Book leading on to Zambia Arithmetic Book One had been chosen as the basis of the television lessons. On July 7th the first programme was televised. From then until May, 1965, three consecutive experiments were carried out in teaching English and Arithmetic to adults of limited education by television. Each experiment gained from the experiences of the one before. Finally the studio was handed back to the Copper Companies on May, 29th, 1965.

PART 1

THE NON-STATISTICAL REPORT

The purpose of this part of the report is to describe the project as a whole; the problems encountered and the facilities available in its preparation and progress, the issues raised, and the general methods and particular techniques used to advance the project. This may assist others interested in the use of closed-circuit educational television in Africa and other less developed areas.

Moreover, whereas the three experiments and their results described in Part II were the kernel of the project, it is necessary to clothe them in this general description so that they can be seen against the conditions in which they were conducted.

The nature of this part of the report therefore makes for a more narrative style than that in Part II.

CHAPTER 1

THE TELEVISION CENTRE

Accommodation

The accommodation at Rhokana needed modification before it was suitable for use as a Television Centre, and it was not until mid-February, 1964, that it was ready to be equipped.

The Television Centre consisted of the studio, control room, classrooms and offices. The studio, which measured 28 ft. × 27 ft. was big enough for all the programmes that were presented. There were two main difficulties, however. Neither sound-proofing nor air-conditioning had been installed. The absence of sound proofing was in this case the less important problem because the noises picked up by the microphones were common to all the classrooms where the programmes were received. They were therefore less distracting than they would have been if the classrooms had been located in an environment different from that of the studio. The absence of air-conditioning was more serious. It not only made work in the studio difficult, especially during the hot season in October and November, but it also affected the cameras so that most of the breakdowns occurred in the afternoons, when the studio was hottest. Air coolers were installed in both the studio and the control room but these had little effect and had to be switched off during the transmission because of the noise they made.

The studio was adjacent to the control room; the two rooms were connected by a two-way loudspeaker system and by the intercom on the switching desk connected to all cameras. By these means, the director could control the three camera operators as well as the camera control units. He was assisted by the sound operator who also made any adjustments required to the camera control units.

The other rooms at the Television Centre were classrooms and offices: two classrooms each equipped with a television screen and each containing 20 numbered desks and the usual classroom equipment such as blackboards; offices for members of the staff; and a room where visual aids were constructed.

Equipment

Altogether £9,905 was spent on the purchase and installation of closed-circuit equipment and £4,500 remained for running costs, that is for the provision of spares for maintenance from July, 1964, till May, 1965. The equipment, listed in detail in Appendix G, was ordered from Philips Electrical Limited, Rhodesia, in October, 1963, and was installed in the Television Centre by mid-May, 1964. The lighting grid was installed two weeks later when alterations had been made to the studio floor which was at first very uneven.

Philips made their final adjustments to the equipment at the beginning of July. Their only remaining obligation then was to deliver the spares and replacements necessary for one year's operation. These were eventually sent by air from Holland.

The maintenance of the equipment was at first carried out by private contract with two engineers from Zambia Television. Subsequently it became difficult to obtain their services and many of the breakdowns caused by minor faults had to be attended to by the Research Fellow and two of the studio assistants. These people had had no formal technical training but had learnt what to do by studying the manuals and watching the engineers at work on repairs.

Minor adjustments continued to be made between July, 1964, and January, 1965, after which the number of faults declined. Though on one or two occasions programmes had to be cancelled because the equipment was affected by heat and lighting, only one programme had to be cancelled because of a technical fault.

Staff (see Appendix H)

While the Television Centre was being established and equipped at Rhokana, a search was made for studio staff. In January, 1964, Mr. A.J. Liebenberg was appointed, as assistant to the Research Fellow, who was Director. He had previously worked as Floor Manager with Northern Rhodesian Television. His first task was to construct instruction books for sound and vision which could be used for training the studio assistants when they had been appointed.

The studio assistants were to be selected from amongst applicants already employed by the mines.

At the end of June, five men were appointed. They were Messrs. Benedict Mwanza, Lawrence Mutale, Jitendra Sampat, Moses Phiri and Sande Kabanda. Of these men, two had already had experience that would be useful in the studio: Mr. Mwanza had trained as a signwriter and Mr. Phiri had had some experience of sound broadcasting in the F.B.C. (Federal Broadcasting Corporation) at Lusaka.

The training of the studio assistants began as soon as they reported for duty.

They were trained in studio techniques by Mr. Liebenberg at the Television Centre, and by Mr. J. Evans, who gave three training sessions in the studios of Zambia Television. With the help of the manuals which Mr. Liebenberg had prepared (see Appendices I and J), the studio assistants were taught to operate the cameras and audio equipment, and the switching panel together with the lighting panel and the various lights on the grid. Later during the second experiment they were taught to direct programmes as well as to switch them so that if anyone was sick, his job could be taken over by another member of the staff. This enabled each man to appreciate the work done by his colleagues. In the final testing phase all direction was undertaken by the studio assistants although during rehearsals they were under the direct supervision of the Research Fellow.

The studio assistants were also trained to produce visual aids. During the first experiment, the provision of suitable aids was difficult because there was only one lesson in hand at any stage of the experiment and this meant that whatever was available had to be used. During the second experiment, there was more time for preparation and the visual aids were made more effective.

Mr. Mwanza was put in charge of the visual aid section, having been trained as a sign-writer and having attended an Arts Course sponsored by the Zambian Arts Trust and run by Professor Julian Beinart of the University of Witwatersrand. The other four assistants were divided into two groups. Messrs. Phiri and Sampat helped with the English programmes; Messrs. Kabanda and Mutale helped with the Arithmetic programmes. They were taught how to make caption cards, many of which were necessary for each lesson. Other visual aids were prepared by the Research Fellow.

From the experience at the Television Centre it appeared that local production staff who had had very little or no previous experience could be trained in a comparatively short time to produce and present a series of television lessons of a relatively high standard. Moreover, they could be entrusted with making small technical adjustments and repairs after very little formal training. Even higher standards of presentation could have been attained had they undergone a longer and more intensive course of training.

CHAPTER 2

THE CONTENT OF THE COURSE

The television experiment was to be closely related to the adult education system which had already been established on the mines. This meant that students could be released from conventional classes to take part of their course by means of television; and teachers could be released from the established adult education system to be trained in television techniques. Both students and teachers would be re-absorbed into the established system at the end of the project. So the content of the television course was related to the content of the courses taught at the Adult Education Centres.

English and Arithmetic, which had been chosen as subjects for the television project, were already taught by the mines. But for the television project courses for each subject, or preferably an integrated course, had still to be adopted. A number of tasks had to be undertaken before this could be done. These were: to find out what books were being used at the Adult Education Centres; to select books for use at the Television Centre; to introduce these books to the teachers at the Adult Education Centres; and, if no course was available which integrated English and Arithmetic, to integrate these two subjects as a single television course.

Survey of English and Arithmetic Books at the Adult Education Centres.

From August till November, 1963, the Research Fellow investigated the materials being used at the Adult Education Centres belonging to the Anglo American Corporation and Rhodesian Selection Trust.

It was found that both English and Arithmetic were taught up to, and sometimes beyond, Standard 4 and that the standards were the same as those found in Government schools. The students followed the curriculum laid down by the Zambian Ministry of Education in order to pass the official examinations. To this extent the centres were the same.

The point at which they differed was in their choice of textbooks for teaching English and Arithmetic. Nearly every centre had chosen different books from its neighbours. Selection seemed to depend not so much on the scientific assessment either of the method of programming or of the results obtained from these courses as on personal preference, availability, price and format. This profusion of textbooks also illustrated the fact that although large numbers were available, none of them had been specifically produced to teach a full course of elementary English to adult urban Africans working in industry. All of them would have needed rigorous adaption if they had been used for the experiment. It emerged from the investigation that the lessons to be presented on television would have to correspond with part of the course in English and Arithmetic taught by the mines up to Standard 4. But it was felt that a further search should be made for more satisfactory textbooks, especially for English. It seemed unlikely that an integrated course would be found.

Selection of English and Arithmetic Books for Use at the Television Centre.

(a) Arithmetic. The selection of an Arithmetic course was in many ways less difficult than that of an English course. For some time it had been agreed by the Adult Education Centres that numeracy was the ability to understand and apply the four basic concepts of Arithmetic: namely addition, subtraction, multiplication and division. Zambia Arithmetic, published by Longmans and recommended by the Zambian Ministry of Education, had been adopted throughout the Copperbelt both in primary schools and in the Adult Education Centres as a means of teaching these concepts. It was also adopted for the television project. It was accompanied by teachers' handbooks but most teachers were familiar with the course already from their own schooling and from their own teacher training and could therefore manage without the handbooks. But the absence of workbooks was a drawback. These were later constructed by the television Arithmetic teacher.

(b) English. The selection of an English course was more difficult. What was needed was a course written up to Standard 4, which included a limited number of graded structures and a limited vocabulary, both taught by means of situations which were of interest to adult towndwellers. It should also afford plenty of opportunities for practice by means of speaking, reading and writing. For this reason, a course which provided workbooks along with the primers was to be preferred.

Since none of the primers being used in conventional classes came exactly within these specifications, a search had to be made elsewhere, and the New Ship English Course, by A.W. Frisby, was selected. The course was immediately available from publishers, Longmans; it covered the first four years of primary schooling and was therefore suitable for use in conventional classes as well as on television, and it comprised primers and workbooks. There were no teachers' handbooks.

Although some adaptation was necessary to bring it into line with the circumstances found in adult education on the Copperbelt, the grading, the vocabulary, the situations and the pace of the course were suitable for adults. The structures were limited in number and conventionally graded. The vocabulary increased gradually. The pace was fast enough for adults although the book had been written originally for children, and this was important because teachers at the Adult Education Centres frequently claimed that students gave up if the pace of the course was either too fast or too slow.

The presentation of material came partly through illustrations which were composed of match-stick figures. At first it was thought that these were too remote from reality to be understood by students who could hardly read or write. But in fact the students could understand them easily except where they were poorly executed or where the idea represented was too complex.

The four primers were accompanied by workbooks which were important in two ways. First they contained exercises which had been carefully prepared to test at every point whether the information in the primers had been understood. In most cases these exercises were admirably suited to the students. Only in two cases did they prove too difficult. In the first case, the students were required to sort out jumbled letters into words or words into recognisable sentence patterns which had already been taught by means of the primer. But they found this very difficult even after they had been given instruction in the vernacular. In the second case, they had trouble with the Pattern Transference exercises. This involved the transference of sentence patterns from one subject to another

e.g. That is Jack. That is Anne.
His name is Jack ....

In the blank space the student was expected to write 'Her name is Anne'. The first of these exercises was introduced in lesson 19, but it was not until lesson 39 that the students learnt to make the transferences effectively. When the Workbooks were amended, the Jumbled-Letter exercises were omitted entirely and the Pattern Transference exercises were converted into comprehension exercises by asking questions which the student had to answer, using an example of a particular pattern as a guide.

The workbooks were also important in that they gave the students an opportunity to practise writing. They could do this by filling in the answers to the questions at the end of every lesson and by completing the drawing exercises which taught them to move their pencils more freely. This in turn improved handwriting.

The lack of teachers' handbooks was not so inconvenient as was expected. In fact, it was debatable whether normal handbooks would have been used even if they had been available, since these seem to make too many demands on teachers who themselves speak English only as a second language and who have in most cases received only two years of secondary schooling and two years of teacher-training. These people claimed that they relied more on their experience as students and later as teachers of language. But, whereas they could teach the Arithmetic course fairly well without referring to the handbook because they were familiar with it already, it was felt that they were likely to have more difficulty with an English course which they had never used before. To try to cater for their needs, Mr. Shamatutu, the Television English teacher, constructed a simple handbook on the basis of his own experience of teaching the course. This handbook was suitable for either television or classroom teaching. In it, the material was laid out clearly, lesson by lesson, so that other teachers could grasp immediately what the content of the lesson was to be and how they should teach it (see Appendix K). Simplified teaching notes along these lines were given to the teachers who took part in the Training Course which was held at the Television Centre in December, 1964, but despite their greater simplicity, the teachers rarely used them (see Chapter 7, page 37).

Introducing the Television Courses to the Teachers from the Adult Education Centre.

After Zambia Arithmetic and the New Ship English Course had been selected, it was felt that they should be introduced to the teachers from the Adult Education Centres to find out how they reacted to the books that were to be used for the television project. Opinions from the teachers were to be gathered in two ways: by means of a short in-service training course and by observing the teachers using the books in their classrooms.

The in-service training course was held from December, 1963, to January, 1964, at Rhokana, the host mine for the television project. The teachers who attended used Zambia Arithmetic and the New Ship English Course as a basis for training in the preparation and presentation of lessons. At the end of the course they said they liked these two books.

Then, at the beginning of the school year, the books were introduced to the students at the Adult Education Centres. A close check was kept during the first six months to find out the teachers' reactions to the books while they were using them. But this was often difficult. On the one hand, the teachers had not been trained to criticise the material they were asked to use and it was therefore difficult for them to make a comparison between one set of materials and another. On the other hand, the Research Fellow found it difficult at times to observe the classroom teachers teaching normally. For instance, he visited one particular class on four occasions, each time with a different guest. Each time, over a period of three months, the same lesson was used as guest entertainment. Consequently, it was almost impossible to judge what sort of progress was being made. The teachers themselves, however, seemed to be more satisfied with the New Ship English Course than with the books they had been using previously.

Integrating the English and Arithmetic Courses at the Television Centre.

English and Arithmetic were to be taught at the Television Centre as a single course. As no course was available which integrated the two subjects, the material from two different books, that is Zambia Arithmetic and the New Ship English Course, had to be integrated by the television teachers in terms of standard, content, and pace. Integration took place gradually during the period occupied by the three experiments.

The problem of integration of standards presented itself in Experiment One. To begin with, all the students taking the television course were required to take the Educational Attainment Grading Test (see Part II, Chapter 1, page 42). From their results it appeared that nearly every student was more advanced in English than in Arithmetic. As a result, they were introduced to the New Ship English Course at Standard One but in Arithmetic they were given My Second Number Book at Sub-B level. However, during the experiment it was discovered that the material used in My Second Number Book was presented again in the first 27 pages of Zambia Arithmetic Book One which is written for students at Standard One. Therefore, in effect, by studying My Second Number Book, the students had begun both their English and their Arithmetic lessons at Standard One.

The integration of the pace of the two courses was considered in Experiment Three. Once again, the students were tested by means of the Educational Attainment Grading Test and once again they appeared to rate lower in Arithmetic than in English. My Second Number Book and Zambia Arithmetic Book One were used as the basis of the Arithmetic lessons. The New Ship English Course Book One was used as the basis of the English lessons. It was found that the students completed their Arithmetic course more quickly than their English course and it was felt that the reason for their faster rate of progress in Arithmetic was that as adults they had had practical experience of numbers although they had very little knowledge of the four basic principles of addition, subtraction, multiplication and division.

Once the connection had been made between the concept and the experience, they progressed much more quickly than the children for whom My Second Number Book and Zambia Arithmetic had been written.

The integration of the content of the course was carried out in two ways throughout the period of the experiments. In the first place, sentence patterns which had been taught in the English lesson were used in the Arithmetic lesson. This was only possible where written problems were given. To have limited the teacher's speech to a certain number of sentence patterns would have made him virtually inarticulate. In the second place, the vocabulary used in the Arithmetic lesson was generally limited to that which had been taught during the English lesson. This was not difficult. Occasionally, however, new words were introduced deliberately during the Arithmetic lesson.

Although some success was achieved, there is still need of a course integrating elementary English and Arithmetic especially in those parts of Africa where there is a demand for both numeracy and literacy in a second language at the same time.

CHAPTER 3

THE TEACHING STAFF

Two teachers were needed for the Television Centre, to teach English and Arithmetic under the direction of the Research Fellow. Each teacher would gain experience of teaching by television and of using television in the classroom. Though neither was expected to have had any television experience before, each should have a pleasant television personality. The effect of using television would be to multiply the effects of teaching, and the chances were that if the viewers liked the teachers they would be more interested in the subjects being taught, whereas if the teachers' mannerisms were eccentric or exaggerated the viewers might easily become irritated and discouraged. Men who could communicate their enthusiasm and interest through their vitality and friendliness were needed.

Their qualifications had to be more or less the same as those of the other teachers teaching at the Adult Education Centres, so that the television teachers could be recruited from amongst the conventional classroom teachers and so that the results of teaching by television could be more fairly compared with the teaching being done in the conventional classroom.

On the whole, the criterion from selection was skill in teaching rather than high academic qualifications.

Selection, and Training before Selection.

Not all the teachers of the Adult Education Centres were willing to be considered for selection. Although they were superficially enthusiastic about television, they were afraid that it would make them redundant. They were also afraid of being transferred from their relatively secure jobs to a project which would end in May, 1965.

Men were not sure what they would be required to do as television teachers and they thought their promotion would be hindered by secondment to the project.

Against these odds, and also against the fact that there was a teacher shortage, the attempt to find television teachers began in December, 1963. This task was linked to the introduction of Zambia Arithmetic and New Ship English Course to the conventional classroom teachers, and to the use of these books as a basis of training the teachers to use better teaching methods. These three tasks were united in the form of an in-service training course and in observation by the Research Fellow of the teachers teaching in the classroom. (See Chapter 2, page 8 and 9).

Twenty four teachers from the Adult Education Centres at Wusikili, Mindola, and Chamboli attended the in-service training course. They were divided into three seminar groups according to the Grades they had been teaching. Seminar One was composed of teachers who normally taught from Grade One to Grade Four. Seminar Two comprised teachers who taught Grades Five and Six. Both of these groups were given the task of evolving effective methods of presentation for English and Arithmetic lessons from the New Ship English Course and Zambia Arithmetic. Seminar Three, on the other hand, which comprised teachers teaching from Grade Seven to Grade Ten, was given the opportunity of presenting lessons from all parts of the wider syllabus used at that level.

All the teachers were expected to present five demonstration lessons for which they prepared visual aids with the help of the tutorial staff. After presentation, each lesson was discussed by the other members of the seminar group. It was then retaught by the tutor and finally discussed again by the group.

Apart from their work with the new textbooks, the teachers also heard lectures on more general educational topics and visited the different sections of the mine so that they could see how their students were employed.

By the end of the course, small groups of teachers had been chosen as possible candidates for the post of television teacher. These men were kept under observation in their classrooms for part of the period which intervened between the end of the in-service training course and the opening of the Television Centre six months later.

When it became clear that the Television Centre would be ready by the beginning of July, two of the teachers elected for secondment. They were Mr. Enoch Shamatutu and Mr. Aaron Kapihya. Mr. Shamatutu was working for his G.C.E. 'O' level examination. He had been teaching for eighteen years and had been a headmaster for part of this time. Mr. Kapihya was also working for his G.C.E. 'O' level examination, but had only two years' teaching experience to his credit. Both men, therefore, had had experience of teaching simple English and Arithmetic to adults of limited education in the classrooms of the Adult Education Centres. Both men had been introduced to the New Ship English Course and Zambia Arithmetic. On the other hand, neither of them had

had any experience of teaching by television nor of using a television broadcast as part of a classroom lesson.

It was arranged that they should be transferred to the Television Centre in mid-June, 1964, and that when the Television project ended, they would return to the staff of the Adult Education Centre from which they had come.

Appointment and Subsequent Training.

At the Television Centre, Mr. Shamatutu was appointed to be in charge of the English lessons and Mr. Kapihya the Arithmetic lessons. Each subject was to be taught both on television and in the classroom; that is, new material was to be introduced by the television teacher during a broadcast and this material was to be reinforced by the classroom teacher in a follow-up period. For English, Mr. Shamatutu was to act as television teacher and Mr. Kapihya as classroom teacher. For Arithmetic, the roles were to be reversed.

There was not a great deal of information about how the television teacher and the classroom teacher should function alone and in partnership to obtain the best teaching results in the circumstances peculiar to the project. This problem had to be worked out by experiment and consultation, using the experience of all the studio personnel as well as that of both teachers. Each teacher developed an understanding of his part in a number of ways. He consulted people who were more highly qualified in a particular aspect of teaching than he was, for instance, the Research Fellow. He consulted people who had different skills from his own, for instance the studio team. He consulted the classroom teacher before and after each lesson to discover how easy or how difficult the broadcast lesson had been from the attitudes and responses of the students and how to improve the lesson.

Lastly, as the classroom teacher he could observe for himself the performance of his partner and the reactions of the students.

An understanding on the part of the classroom teacher was developed by the same type of consultation and experience. This understanding developed only gradually.

The need for time in such training was clearly illustrated by the recruitment of a replacement classroom teacher in Experiment Three. He experienced a number of difficulties. First he had difficulty with the television set, complaining several times that he was not receiving the broadcast. In each case it was because he had not tuned the set before the lesson started, and it took at least four periods of instruction before he was confident enough to do the tuning and regulating himself. Second he had been conditioned to think that the television screen could only be seen in a darkened room and needed constant reassurance that one of the advantages of television was that it could be used in a well-lit room. Third, he had difficulty with the follow-up period, being content to let the broadcast dictate to him, and reteaching the material of the lesson in the way that the television teacher had already presented it. Only occasionally did he try to break-away and create something personal to his class.

Lastly, he found it difficult to advise the television teacher about teaching problems and ways of overcoming them becuase he knew very little about television teaching.

It seemed that many of the advantages of using television as part of the classroom lesson could be lost if the classroom teacher was untrained in its use.

It was then asked whether the classroom teacher was really necessary if the reception of the broadcasts could be ensured; that is, whether the class could be taught effectively by the television teacher without the help of the classroom teacher. This was tested in Experiment Three. One of the groups taking part in the experiment was taught by the television teacher alone.

The television set was turned on and the group was left alone in the classroom without a classroom teacher there to help them but occasionally with an observer. They were therefore forced to help one another. This help was often haphazard and misdirected, and the lack of supervision at times prevented the television teacher from eliciting responses. Frequently, when some students answered questions put to others, the class was disrupted by shouting. Thus, it was felt that in the teaching of language to this particular group of students, some way of monitoring responses was desirable so that order could be maintained in the class while the broadcast was being given.

In Italy, the value of monitoring broadcasts to adult education groups has already been recognised by Telescuola, Italian Educational Television. The monitors are not necessarily teachers or highly qualified people. Cassirer (1960) writes, "A ...... monitor should be in charge of each (reception) point, above all to check attendance, supervise discipline, and submit regular reports on student achievement ...." But some monitors are qualified to do more. Cassirer continues, "If the monitor has sufficient qualifications, he may also help pupils in carrying out their regular assignments, or answer questions and correct student work."

At the Television Centre two different monitors were tried out. One was the ordinary classroom teacher untrained in television and the use of television in the classroom. The other was the classroom teacher trained in these techniques. On the whole, it emerged that better teaching results could be obtained by a television teacher in partnership with a classroom teacher trained in the use of television than by a combination of a television teacher and a classroom teacher who had received only conventional training.

CHAPTER 4

VISUAL AIDS

Since television is essentially a visual medium of communication, the proper selection, production, and use of visual material to illustrate teaching points is important. Japan Radio states, "The most unpopular case in educational television programmes occurs when a programme is presented only with talks by a teacher whose face appears on the screen for a long time." (Radiotelevisione Italiana, 1961.) The man who is planning the programmes, therefore, must develop ideas on how illustrative material can best be used in his particular circumstances to communicate information clearly and interestingly. In particular, he must know about the type, size, quantity, variety and use of this material.

At the Television Centre, the man who planned the programmes was the television teacher. With the assistance of the Research Fellow, he decided which visual aids were needed for each broadcast, but he was generally too busy preparing the content to produce the aids as well. This task fell to the studio assistants who had been trained in the production of visual material for use on television (see Chapter 1, page 4). Many kinds of aids were used. They can be divided into pictorial, non-pictorial and 'other' categories.

Pictorial Aids.

The pictorial aids generally formed the backbone of the lesson. They included photographs, drawings, cartoons, diagrams and caption cards. Apart from the photographs provided by the Copper Miner and by the Anglo American photographer, they were made in the studio. Drawings and cartoons were occasionally taken from books but others were produced by the Research Fellow. Diagrams and caption cards were constructed by the studio team.

Two principles guided the production of the material. Firstly, every item had to be large enough to be seen by the whole class. Frequently, the pictures found or made by the studio assistants were too small to be seen clearly. Secondly, the picture had to illustrate simply and clearly the point the teacher was making. This caused great difficulty. Very often the teaching point would be obscured by a mass of detail and although the studio assistants had made some improvement by the end of the experiment, satisfactory pictures would only have been obtained by longer training.

The materials for construction included paper of various shades. Orange or yellow paper was preferred to white where the lettering was black because white paper was inclined to flare. Black paper was used as a backing for letters that were to be superimposed on an image on the screen (see Chapter 5, page 24).

Lettering was done by means of Letraset and Econosign stencils. Both of these techniques of producing letters were mastered quickly by the studio assistants only one of whom had had previous training in the use of stencils. In Letraset, the letters which aré printed on a sheet are transferred directly to the visual aid. Many typefaces are available. Number 244 was used at the Television Centre. White letters of this type-face were fixed on black cards of 6 inches by 4 inches but when black paper or card was in short supply, yellow paper was used as a backing for black letters and the camera controls were reversed so that the letters appeared dark against a light background. Lettering by means of Letraset was found to be extremely effective, but it was expensive, and it was sometimes difficult to obtain the right type-face. In general, it was used for producing small visual aids for use with the camera with the fixed lens, whereas the Econosign stencils were used for the production of larger visual aids for use with the two cameras with zoom lenses.

One of the most effective ways in which pictorial aids were used was in the technique of super-imposition used especially for reading.

After each programme the pictorial material was collected and filed away in a filing cabinet. Other lessons using the same material could then be prepared much more quickly.

Non-Pictorial Aids.

Of the non-pictorial aids, adhesives such as the flannelgraph, magnetic board and plastigraph were most useful. Of these three, the flannelgraph was the most frequently used together with pictures and diagrams backed by flock paper or stuck on with scotch tape. In Arithmetic, for instance, the calculation was fixed to the board, the working was done, and the conclusion fixed in the answer space. In this way, the illustration was introduced quickly, efficiently and without distraction.

The advantages of using adhesives are many. They can be clearly seen. The surface of the display board can be used repeatedly without becoming dirty. The visual material can be used again if it is filed away at the end of each lesson. The chance of the teacher obscuring the picture with his hand is less than it would be if he wrote on the blackboard. Pictures can be built up more quickly and accurately by this method than by using the blackboard. For these reasons the blackboard was never used at the Television Centre.

Other Aids.

These included models, animations, puppets, demonstrations and dramatisations. Great emphasis was placed on the use of models or on the actual object that was being referred to. Models of houses, motor cars, human beings, fruit and birds were stored in the studio. Objects such as chocolate or bananas were brought to the studio when needed.

Animations were used sparingly because they were very difficult to prepare and because an action, such as a man walking, could be demonstrated more easily by an actor walking across the studio. The students seemed to prefer to watch an actor.

Puppets were popular. Both glove puppets and marionettes were used, and the students were delighted with their exaggerated movements and amused at their antics. It would have been better if the puppets had been made at the Television Centre but nobody had been trained to do this and consequently they had to be bought locally from a limited range. They were only used to illustrate very simple situations. But had there been more opportunities for training and more time for rehearsal, puppets could have been used to illustrate any situation, simple or complex.

More complex situations were presented by means of demonstration. The number of actors taking part depended on the content of the lesson but it was never more than three. This was partly because the actors were, in reality, the cleaner and other members of the studio team and during transmission no more than three men could be spared. The length of each dramatisation varied and was determined by the content of the lesson. Rehearsals often took a great deal of time depending on the complexity of the material. For instance, in Arithmetic, dramatisations were used particularly for money transactions. A shop was set up in the studio. Customers were shown buying goods at the shop. Their transactions illustrated the point the television teacher had introduced in that lesson. These lessons were very successful because dramatisation served to humanise the teaching.

Most of the visual aids used at the Television Centre were relatively simple and cheap to produce. The materials needed for construction were obtained locally. Occasionally, supplies ran out, but this problem might have been overcome later once a demand had been established.

The use of this material on television was important in two respects. First it made learning more effective. Students felt that good use of visual material made teaching more interesting, easier to understand, more compelling to watch and more memorable. It seemed to contribute to the holding power of the course.

Second it could change the way in which some conventional classroom teachers taught. Very few visual aids had been used in the conventional classrooms before the television project started. The classroom teachers had been encouraged by their instructors to make them during their period of training, but once in the classroom they found that they had too little time, skill and incentive to make extra visual material; and they became sceptical of its use. Then in December, 1964, a short in-service training course was held at the Television Centre (see Chapter 7). A small group of classroom teachers attended and were shown how English and Arithmetic lessons were presented on television. One of the aspects of the teaching which impressed them most was the use of visual material. In their own demonstration lessons they began to make and use their own material with the guidance of the course tutor, and by the end of the course they had become enthusiastic about using visual aids in their own classrooms. In this way, television helped to improve their teaching.

CHAPTER 5

THE TELEVISION BROADCAST

English and Arithmetic had been chosen as the basis of the television broadcasts. As it was felt that both subjects are languages in that both of them are ways of communicating information by spoken and written signs, there seemed to be justification in treating them in the same way. Thus in this chapter, the remarks about the teaching of English are equally applicable to the teaching of Arithmetic. In both subjects, the television lesson consisted of a warming-up period, used only in Experiments One and Two, a broadcast and a follow-up period. The broadcast was presented by the television teacher, whose job it was to introduce new material to the students. The production of the broadcast can be divided into preparation and presentation stages.

Preparation.

Preparation for the broadcast was divided into two parts: first the television teacher prepared the material to be taught, then he rehearsed his lesson in front of the television cameras.

He prepared his material with the help of the Research Fellow and the classroom teacher. Having selected suitable items from the primer, he allocated the material by deciding what should be presented on television and what should be left till the follow-up part of the lesson. He then decided how to present the material, that is, the order in which it should be taught, the amount of repetition needed, the kind and amount of practice for each item, the percentage of the broadcast to be devoted to each activity, the way in which the broadcast should be related internally to others in the series and the way in which the material should be illustrated.

Having discussed all this with the Research Fellow and the classroom teacher, he prepared shot lists (Appendices L and M) with an outline script and instructed the studio team to produce the visual aids.

Only one outline script was used because it was felt that learning a full script by rote would have been too onerous for the television teacher and would have made his performance look unnatural (see Chapter 6, page 28). An outline script, on the other hand, indicated the order in which the various camera shots were to be taken, and was helpful to the television teacher, the camera man, the property men and the director.

When the script and the visual aids were ready, a rehearsal of the lesson took place in front of the television cameras. During the rehearsal, the classroom teacher worked together with all the other people in the studio and his performance was observed by the Research Fellow from the control room and, if possible, by the classroom teacher from the classroom. Afterwards, any weak points noticed by the observers were discussed with the television teacher and the studio team. Another rehearsal took place immediately, if necessary, so that the final performance could be as polished as possible. The lesson was then ready for presentation.

Presentation.

The broadcast was divided into four stages; the opening, the body of the lesson, the period of review, and the closing.

The Opening. This was often constructed after the lesson had been devised. It was intended to fix the attention of both the students and the classroom teacher on the television screen. This was done in two ways: by the music and by the opening shots. The music was generaly African. The opening shots varied. Very often they gave a preview of the lesson. For example, in Arithmetic the credits could be superimposed over a problem that would be dealt with in the body of the lesson. At other times they showed information which bore no relation to the lesson, for example an article from the daily newspaper. A short commentary on these opening shots was given by the television teacher. If he felt that his commentary or instructions were too complex to be understood in English, he gave them in Bemba.

Immediately after the opening, in the English lessons, the students were given exercises, limited to deep breathing because other exercises would have demanded too many complicated instructions. The students appeared to exert themselves quite willingly. It was felt that this activity would help to focus their attention on the content of the lesson, though no evidence of this became available.

The Body of the Lesson. For the body of the lesson, a specific teaching pattern was developed for both English and Arithmetic. It consisted of three steps similar to the steps of a conventional lesson: first, a sentence pattern was introduced to the students by the television teacher who said it and illustrated it; second, the sentence pattern was repeated several times by the television teacher and by individuals and groups within the classroom; third, the sentence pattern was written on the screen so that the students could practice reading.

The first step in the pattern corresponded to the introduction of a lesson in the classroom. New material was introduced to the students both orally and visually. The material was introduced in terms of the things the class already knew. New vocabulary was introduced by means of familiar structures, new structures were clothed in familiar vocabulary, and both were introduced in terms of simple ideas and familiar situation.

The new material was enunciated as clearly and accurately as possible. Speaking clearly when teaching a foreign language is very important. The television teacher therefore spoke loudly, slowly and naturally so that everyone in the classroom had a chance of hearing and of trying to understand. Because his own language was other than English, he had to try to make his pronunciation, stress and intonation as nearly English as he could because he provided the model that the students imitated. Ideally, the television teacher should have provided a better model than the classroom teachers from whom he had been selected but at the time of selection more emphasis had been placed on teaching ability than on academic ability and, consequently, the standard of spoken English used on television could have been better.

The new material was illustrated at the same time as it was spoken, thus making learning more effective by engaging more senses. The use of visual material is especially important where new concepts are being taught. Therefore, when a new word was introduced to the class, a model or a picture of it was simultaneously shown; when a new action was introduced, it was mimed or dramatised. The students heard the word or phase, saw the illustration and associated one with the other, thus learning better.

Once the material had been clearly introduced, the body of the lesson moved into its second step; that is, the practice period. "It should be the teacher's task to teach the ready use of sentence structure", write Lee and Coppen (1964). P. Gurrey (1955) states, "The teacher's first concern is to get the pupil's language abilities into action, for only when there is activity with language is there any language learning at all."

The practice period was generally an extension and development of the previous step. For instance, mimes and dramatisations were frequently used both for introducing new material and for practising it. These two aids in particular were used because new language could be practised and sentence patterns repeated in relation to particular situations and they therefore became more interesting and real to the student.

Television has the advantage over the conventional classroom here. In the conventional classroom, mime and dramatisation are much less often used because of the difficulty of producing them in the time available and also because the classroom teacher can only rely on his own ability as an actor. Very simple actions were sometimes used in conventional classrooms on the Copperbelt. For instance, the teacher would ask one of his students to open the door. The student would cross to the door and open it and the teacher would ask a second student what the first one was doing. The second would answer, "He is opening the door." The mimes and dramatisations that were presented on television and used for practice were much more substantial than this (see Chapter 4, page 18) and the students could only act out the incidents themselves after the broadcast had finished. They did this in the follow-up period with the help of the classroom teacher.

Of the other methods of practice that were familiar, the chorus method was also popular. Gurrey (op. cit.) warns, "Unfortunately, too many teachers in the past have used the Chorus Method inefficiently, and have put up with mechanical humdrum repetition; and they have allowed their pupils to shout in chorus so loudly and inattentively that mistakes have been repeated every time." The fault lies not so much in the method as in the circumstances in which it may be carried out. Three conditions were borne in mind at the Television Centre. First, the size of the group being drilled was varied. Sometimes the whole class was drilled together; at other times only a section of the class was used. Second, the students were encouraged to speak the sentences softly. This was sometimes difficult on the Copperbelt because the students sang a great deal and enjoyed the chance of raising their voices in chorus. Third, the teacher insisted on an increasingly exact imitation of his model. This can be very difficult where the teachers themselves have a poor grasp of spoken English because they can neither provide a good model nor detect inaccuracies in their student's speech.

The use of television for practice had several advantages. First, the more effective use of a greater variety of visual material in television made practice more interesting. Second, the television teacher commanded more attention than the conventional classroom teacher. Unlike the classroom teacher, he appeared to be looking at every member of the class at once. Nobody knew who would be called on next to answer. Everyone, therefore, attended to what was being said. Third, it appeared that because the television teacher was more remote, answers to questions were firmer as well as quicker than they would have been normally. It was found that more rounds of practice could therefore be attempted.

The third step in the body of the lesson took the form of applying what had been practiced. Although when a new language is being taught, reading and writing are generally omitted from the lessons until the students have mastered a small amount of the language orally, it had been noticed that the students of the Copperbelt were disappointed if they were not allowed to practise these skills from the first lesson. Most of them could already write their own names and read a little. This reading and writing had been introduced alongside oral work in English and Arithmetic in the conventional classroom after 1964. It was decided that the same opportunities should be provided during the television lessons.

Only material that had been well-practised orally beforehand was used for reading. Normally, an attempt was made to establish or reinforce a relationship between the written word, the sound and the thing or activity. In the conventional classroom, this was often done by reading the text and referring to an illustration. On television it was much more effectively achieved by superimposition; that is, the picture that had been used as an illustration during the oral period was left on the screen; the words of the sentence pattern were superimposed on it; this was held for a short time and then the action was faded out, leaving the written symbol only, with the voice of the television teacher or 'actor' maintaining a link between the action and the abstraction. This was found to be very effective. (See Pages 61-63).

In the conventional classroom, writing too would be practised at this stage. But during the television broadcast there was no time for writing practice. This had to be left until the follow-up part of the lesson or done for homework.

The Period of Review. The aim of the period of review was threefold. It was necessary to summarise the concepts developed in the body of the lesson, to let the students prove to themselves that they had learned these concepts, and to provide the teacher with evidence that they had in fact learned them. A good review often created a desire for further information and contributed to the holding power of the course. It was generally accomplished by explaining the use of what had been learnt and by indicating the way in which the relevant exercises in the workbook should be handled during the follow-up part of the lesson. One of the advantages of using television was that students could be shown exactly which exercise they were expected to do and how they were expected to do it. In normal classroom conditions this can be difficult. Often students cannot see what is being referred to until the teacher gives them individual attention.

The Closing. Each television lesson ended with a brief closing session. Sometimes the opening was repeated. Sometimes an important part of the lesson was shown by means of pictures on the screen. Suitable titles were superimposed on these pictures. African music was played in the background.

Revision. At intervals throughout the course, material that had already been taught was revised by means of reading lessons. These were longer and patterned differently from the period of reading practice included in the body of the language lesson. They had two forms. In the shorter reading lesson, a sentence pattern appeared on the television screen and the students were instructed to read it either individually or in groups. The action relating to the pattern was then superimposed on the words. Sometimes the wrong action was deliberately superimposed. This gave the students the opportunity to react in such a way as to show not only that they could pronounce the sentence, but that they could also understand its meaning.

In the longer reading lesson, the television teacher began by reading through a passage which appeared on the television screen. He then read the passage slowly, stopping at the end of each sentence to ask a student or a group to repeat the sentence in the way in which he had read it. When the passage had been read for a second time, the television teacher with the aid of two actors in the studio demonstrated the technique of paired reading. The two actors sat together and took turns in reading the passages, sentence by sentence. The class was then instructed in the vernacular to divide into pairs and to read the passage from their books in the way the actors had demonstrated. It was found that this technique was soon mastered even by the experimental group that had no classroom teacher. In the group with the teacher the reading was supervised by him. This was found to be one of the most successful ways of revising.

The effectiveness of the broadcast was tested in the follow-up period by using the workbooks. These had been designed to test whether the students had grasped the materials of the course at the end of each lesson. The students were therefore asked to try to complete during their follow-up period, the exercise which related to the material of the broadcast. They were assisted by the classroom teacher who checked answers and interpreted them for the television teacher. If results were poor, another lesson on the same subject was given before any new material was introduced. But it was obviously inefficient to spend time teaching material over again if the cause of the original difficulty could be located.

It was found that at least part of the difficulty was caused by the workbook exercises themselves, in that they had not been specifically written for these students, who found the Jumbled-Letter exercises and the Pattern Transference exercises confusing (see Chapter 2, page 8). Adaptations were made to the workbooks during the period of the three experiments. Exercises were made easier for the students to understand and they were therefore a more accurate test of whether the students had understood the broadcast. Fewer lessons had to be repeated; therefore, the pace of the course became much faster, the frustration of having to repeat a lesson already learnt was reduced, interest and the feeling of achievement was increased.

CHAPTER 6

A NEW SYSTEM OF CLASSROOM RELATIONSHIPS: TEACHERS, STUDENTS AND THE TELEVISION SET

Television is generally a one-way system of communication; that is, information only flows in one direction - from the screen to the viewer. But one-way communication is only used in a classroom when a lecture is being given. During a lesson, a two-way system is needed to cater for the give and take between the teacher and the class. Therefore, if television is used for classroom teaching some way of overcoming its limitations must be found.

The problem is generally solved by having more than one teacher; the television teacher who introduces new material to the class and the classroom teacher who helps them to learn it. In this way three new sets of relationships are established: between the television teacher and the class, between the class and the classroom teacher, and between the classroom teacher and the television teacher.

Television Teacher and the Class.

It is the job of a television teacher to construct and present a course which suits the needs and characteristics of a particular group of students. This means that before a course can be designed the television teacher must have information about the students who are likely to be watching. At the Television Centre, this information was gathered in three ways: first, the television teacher had already had experience of teaching students like these in the conventional classroom; second, the students were asked to sit a battery of tests before they began their courses and the results of the tests were given to both the television teacher and the classroom teacher; third, the classroom teacher observed the reactions of the students in the classroom and passed on this information to the television teacher.

The courses at the Television Centre were constructed to fit these facts. But three main problems arose. These were, to decide which was the best way of communicating with a group of students in a distant classroom by means of television, to decide how to elicit answers from a potentially large audience without knowing their names, and to decide how to 'hear' the students when they answered.

Problem One: Communicating Information. The problem of communicating with the students through the television screen was tackled with the aid of both the studio team and the classroom teacher.

To begin with, various circumstances were considered. For instance, in Telescuola (Italy), the television teacher sometimes teaches a small group in the studio and the student-viewers watch him doing this. This method was rejected at the Television Centre because it was felt that the teacher tended to concentrate on teaching his own class rather than on teaching the many students who were watching, and this diminished his influence on the viewers.

It was felt that the television teacher should communicate with his class as directly as possible in order to hold their attention and interest. It was, therefore, decided to adopt the method generally used by Telescuola for teaching adults. This meant that the television teacher spoke directly to the camera and to the students in the distant classroom so that it appeared to each member of the class as if the teacher was speaking to him individually in private conversation.

The television teacher and the studio team worked hard to preserve this illusion. An atmosphere of friendly and willing co-operation was created in the studio so that the television teacher could feel at ease and act naturally in front of the cameras. This feeling of ease released the vitality of his voice and manner thus enabling him to communicate his interest and enthusiasm more effectively. For this reason too, only an outline script was used.

But even natural actions sometimes look artificial on the television screen and the television teacher had to learn how to act in front of the cameras in order to appear to behave naturally to the students. For instance, he had to try not to make the transition from one camera to another too jerky and although he could move about the studio quite freely he had to remember to indicate to the programme director where he was going; to move more slowly and deliberately than usual because television cameras are not built to reproduce quick, natural movements; and to make certain that he did not obscure the visual aids.

The responsibility for making sure that the students received the broadcast fell to the classroom teacher. He did this by preparing the classroom and by assisting with the presentation. The classroom was prepared for reception in three ways. First, it was well-illuminated. One of the most important characteristics of television is that it can be used in daylight. This means that the viewer can see and do more things during the broadcast. Curtains were only drawn, therefore, where reflections caused difficulty in seeing the image. Second, the desks were arranged so that each student could see the screen. Later difficulties in seeing were straightened out by moving the television set which was on wheels. Third, the television set was connected to its socket and tuned to the station at the correct volume. It could then be left on indefinitely because no other programmes were broadcast from the same station.

The classroom teacher was also responsible for preparing and maintaining an atmosphere in which learning from the television teacher could take place. He made the students feel that they were starting out on a completely new lesson every day by putting away visual aids which had been used before and by cleaning the blackboard. He made sure that the students were properly equipped to follow the broadcast and established procedures for such things as leaving the room and sharpening pencils. He acted on behalf of the television teacher; that is, if the television teacher asked the students to sit in pairs for reading practice, the classroom teacher made sure that they carried out the instruction. He gave encouragement and help where he could and, in general, kept order in the class. And he was largely responsible for moulding the students' attitude to television teaching; that is, whatever attitude he himself adopted was quickly communicated to the students and they reacted accordingly. If he was hostile to television teaching, he generally managed to influence his students against it. At the Television Centre, the classroom teacher was always encouraged to show his enthusiasm for the broadcast, thereby influencing the students in its favour.

Problem Two: Eliciting Responses. The problem of eliciting responses from a potentially large audience without knowing their names was again solved with the help of the classroom teacher. It was decided that numbers should be used instead of names. The number of desks in the television classroom was limited to twenty, and on each one was placed a card with a number from 1 to 20.

In the studio a pack of cards numbered from 1 to 20 was shuffled before each lesson so that no particular pattern of numbers emerged. These acted as a prompt by which the television teacher could elicit a response by calling on a particular number, and the student who had the number on his card had to try to answer. If one of the desks was empty, either the classroom teacher filled the gap and responded when the number of the empty desk was called or he gave an additional number to one of the students.

The television teacher could elicit responses from either individuals or groups. It was the job of the classroom teacher to organise these responses. This was important. Without supervision, the good students tended to give all the answers and the weak students, who needed the practice, tended to give none at all. When answers were given by the wrong people, the class grew restive and communication between the television teacher and the class broke down. The classroom teacher was there to prevent this from happening by restraining the over-eager students and encouraging the weaker ones.

Problem Three: 'Hearing' Responses. The problem of 'hearing' replies made at a distance was again solved with the help of the classroom teacher. However loudly the students answered, the television teacher could not hear them because there were no talk-back facilities at the Television Centre, but he pretended to hear the response. The classroom teacher, therefore, acted as the 'ear'. He listened to the replies the students made to the questions asked by the television teacher. Where they had difficulty, he gave them assistance; where they replied wrongly, he corrected them. The impressions he gained from listening were used as a basis of his teaching in the follow-up period after the broadcast. They were also conveyed to the television teacher after the television lesson.

The Class and The Classroom Teacher.

The most important part of the classroom teacher's job is to work with his class in order to help them to understand and remember the material presented during the television broadcast. Like the television teacher he needs information about his students before he can fit his teaching to their needs. At the Television Centre both the television teacher and the classroom teacher gained their information by the same methods (see above, pages 27 and 28). But the two teachers used their information in different ways. Whereas the television teacher used it to construct and present the course to the whole class, the classroom teacher used it to help each student individually. He was the only teacher who got to know the students personally and who knew what their interests were, what their difficulties were as individuals, what their relationships were with one another. He could therefore interpret the teaching material at a much more personal level than the television teacher could. He was thus responsible for recognising and, if possible, solving particular personal problems. These problems could be of any kind. For instance, one man of 48 made very little progress until it was discovered that his eyesight was so poor that he could read only with the greatest difficulty. Consequently, he was moved to the front of the class where he could see the television screen more easily and from then onwards, he made steady progress.

The classroom teacher was expected to extend and enrich the experience of each student by using the broadcast as a springboard. This meant that he had to find out before the broadcast what the content of the lesson was to be and what visual aids were needed in the classroom. Normally, he would have done this by consulting a teacher's handbook, but at the Television Centre he attended a pre-broadcast consultation with the television teacher and the Research Fellow.

The broadcast formed the core of the television lesson which comprised a warming-up period supervised by the classroom teacher, a broadcast presented by the television teacher assisted by the classroom teacher in the classroom, and a follow-up period supervised by the classroom teacher.

The Warming-Up Period. In Experiments One and Two, the students were given a warming-up period of thirty minutes before the broadcast to complete written work set in the previous lesson, and to be introduced by the classroom teacher to the material they were to be taught that day.

During Experiment Three, however, the warming-up period was omitted. The students were encouraged to complete all written work before leaving the Television Centre each night. They listened to the broadcast the next day without an introduction from the classroom teacher. They seemed to have no greater difficulties than their fellows in Experiments One and Two. It appeared, therefore, that a warming-up period was not essential at this level; it may also have been that the teacher was inadequately trained to make the warming-up period successful. Only a well-trained teacher can introduce effectively a lesson presented by another.

The Broadcast. The way in which the classroom teacher helped the television teacher during this period is discussed above, pages 29 - 30.

The Follow-Up Period. The follow-up period came immediately after the broadcast. The amount of time devoted to it and the use that was made of it depended on the classroom teacher. Generally, he took the broadcast as his guide and re-presented it to the students. This was done most successfully when the re-presentation was extended and developed beyond the limits of the broadcast. In this way, the classroom teacher was able to re-emphasise the main teaching points. He checked to see whether these had been understood by going over some of the television exercises with the class. If he found that they had difficulty, he re-taught the material at their ability level. This rarely had to be done at the Television Centre since the broadcasts were geared specifically to the ability of the groups attending the television course.

Plenty of oral and reading exercises were provided so that the new material could be better learnt. This material was related to the lesson which had already been done and the students were shown how it fitted in with the lessons that were still to come, so that they could appreciate that their lessons did not exist separately but were all related to one another.

Finally, the classroom teacher assisted the students with the written exercises which they had been asked to complete in their workbooks. These were marked as soon as they had been finished. The classroom teacher was instructed to mark only those answers which were correct, for it was felt that adult students would prefer not to have their books covered with red ink. Where it was obvious that the student had been unable to do the exercise, the teacher was expected to see him at the beginning of the following lesson in order to explain his difficulties.

A variation on the use of the follow-up period was provided by the group which had no classroom teacher in Experiment Three. They determined the length and the use of this period for themselves. Instead of practising oral work and reading, they began immediately on the written exercises in the workbook. This omission of oral drills and reading may have contributed to making their learning less effective (see page 76).

The Classroom Teacher and the Television Teacher.

The classroom teacher and the television teacher cooperated, by teaching the same material to a class of students, and trying to improve the effects of their teaching for purposes of the experiment.

Teaching the Students During the television lesson, the television teacher presented new material to the class and the classroom teacher helped him from the classroom end to communicate with the students. The classroom teacher also, by his release from the burden of presentation, had more time to devote to the students individually, to help them learn the material presented by the television teacher. He therefore acted as an intermediary between the television teacher and the class.

This means that the part played by the classroom teacher using television is different from the part played by the conventional classroom teacher. The conventional classroom teacher is responsible for presenting new material and also for giving individual attention to the students. Because the classroom teacher using television is no longer responsible for presentation, it is often mistakenly thought that he has lost status. In fact, not only must he have a detailed knowledge of the teaching material so that he can interpret it and develop it for his class, but he must also know about methods of presenting it so that he can make constructive criticisms to the television teacher. He should be at least as highly qualified to teach the subject as he was before television came.

If it is thought that he has lost status in relation to the conventional classroom teacher, it is also possible that his status will be interpreted as lower than that of the television teacher. At the Television Centre, however, the two teachers co-operated on an equal footing, perhaps because they acted as television teacher and classroom teacher alternately. Whatever the relationship, it was found to be necessary for each teacher to accept his part and know how to operate within it in front of the students. Only when the students could feel that the teachers were working with one another to help them achieve their aims was the teaching process likely to be successful.

Improving the Effects of Teaching The television teacher and the classroom teacher at the Television Centre co-operated not only to teach the students but also to try to improve their teaching for purposes of the experiment. They did this by discussing the nature, form and content of the broadcast before it began. During the broadcast, the classroom teacher observed the performance of the television teacher and the reactions of the students and afterwards discussed each of these with the television teacher. Subsequently, this led to the modification and improvement of the broadcasts. The partnership of these two men was particularly valuable because, since they had had the same experience, they could appreciate one another's difficulties and increase the value of their criticism and suggestions.

This indicated that even where television is being used not as part of an experiment but normally to teach students in schools scattered over a wide area, there is value in the classroom teachers being able to consult the television teacher. He should know what is happening at the classroom end and how he can improve his presentation. They should be able to discuss with him how the course is likely to develop and how they can help to make it more successful in the classroom. The more frequent these consultations, the greater the understanding between the television teacher and the classroom teacher and the greater the opportunity for more rapid improvement in teaching.

CHAPTER 7

THE EFFECTS OF TELEVISION ON TEACHING

'Finally,' writes Cassirer (1960), "it should be stressed that all educational television designed for use in classrooms, even though it appears primarily aimed at students, has a definite value for the in-service training of teachers." This certainly seemed to be true in relation to the two teachers employed in the television experiment. But they were in a special position because they not only acted as classroom teachers but also presented lessons by television. What then of the ordinary classroom teachers in the Adult Education Centres? Would their teaching be improved if television sets were introduced into their classrooms? It seemed probable that benefits would be gained from watching a series of programmes prepared and presented by men who had been chosen for their special teaching ability.

The In-Service Training Course.

It was decided that the television series in English and Arithmetic produced at the Television Centre should be used as the basis of an in-service teacher training course, held at the Television Centre for two weeks in December, 1964, under the direction of the Research Fellow and Mr. Jason Mfula, an Assistant Education Officer from Mufulira Adult Education Centre.

Purpose. The purpose of the course was not to train the students to use a television broadcast in the classroom but to improve their own conventional lesson preparation and presentation by using lesson-planning, better methods and more visual aids, and by comparing the lessons they had presented to the same lessons presented on television by Mr. Shamatutu and Mr. Kapihya.

Organisation. The number attending the course had been purposely limited to allow each teacher more opportunities of presenting lessons. Eight teachers from Mufulira attended. They were divided into two seminar groups which followed this timetable:

8 a.m.	-	10 a.m.	Preparation of lessons.
10 a.m.	-	10.15 a.m.	Break.
10.15 a.m.	-	11.15 a.m.	Presentation of lessons.
11.15 a.m.	-	12 noon	Criticising lessons.
12 noon	-	11.30 p.m.	Lunch.

1.30 p.m. -	3.30 p.m.	Observation of broadcast. Criticism and discussion.
3.30 p.m.		Return to home centre.

The lessons the teachers prepared were English and Arithmetic lessons based on the New Ship English Course and Zambia Arithmetic Book One. They were required to teach in the morning the lesson that would be presented on television in the afternoon so that they could compare their own attempts with the attempts of the television teachers.

Each seminar group was responsible for the teaching of either English or Arithmetic on alternate mornings. The seminar responsible for English presented the lesson twice, thus allowing two people to practise presentation. The seminar responsible for Arithmetic did the same. Thus four lessons were given every day in the ten day course making a total of forty lessons in all. Each of the eight members of the course was therefore given the opportunity of presenting five lessons.

Training followed a set pattern. At the beginning of the course each member was assigned specific lessons in English and Arithmetic, which he was expected to prepare and present during his stay at the Television Centre. First he studied each of his lessons and decided what visual aids he would need as illustrations. He could use anything that had been made previously by other members of the course or by the studio team. If he wanted to make something of his own he could do this with the help of the tutor or the staff at the Television Centre.

After presentation in front of the other members of the course, the lesson was discussed under the guidance of the course tutor, and any points which were criticised were re-taught either by the tutor or by other course members. In the afternoon everyone observed the same lesson being presented on television by the television teacher. After transmission, the broadcast itself was discussed and criticised under the direction of the Research Fellow and the course tutor. In addition, the members of the course were encouraged to discuss the programmes and their own lessons with the television teachers.

It would have been better if each seminar group could have had its own tutor, but unfortunately this could not be arranged. Much of the success of the course depended on the enthusiasm, interest and knowledge of the tutor, and it was important that he knew in detail what the subject of the course would be so that he was prepared to lead discussions on individual lessons.

At the end of the course each member was asked to write an account of his experiences and opinions. In general, they said that they felt it should have been longer and should have covered a wider field.

Results. The teachers began to make lesson plans. At first most of the teachers did not understand how to plan their lessons. When questioned, they were frequently unable to state their aims, and although teaching notes were provided for both English and Arithmetic these were rarely consulted and even more rarely used. But by watching the television lessons and by copying in their own lessons what was done, they gradually became aware that they needed to know in advance how the lesson was to proceed in order to control it and to make learning better.

They began to consider different approaches to their subjects. They came to realise that the subject of the lesson could be presented in different ways and that some ways were more effective than others. It was up to the teacher to use the approach he considered best for his class.

They made progress in the manufacture and use of visual aids. At first they were extremely sceptical, but their opposition, which may have been caused by insufficient training, was broken down when they saw how effectively visual aids were used in the television lessons. They started making their own with the help of the course tutor and the staff at the Television Centre, and they were encouraged to collect examples in the form of a scrapbook to take back and use in their own classrooms. A prize was presented to the man who compiled the best scrapbook. More important, they began to use a greater number of illustrations in their demonstration lessons, and it seemed that although they had been taught about them in their initial teacher training course, they had never used them, nor realised their value until they saw them being used on television.

They began to appreciate that students learnt by doing rather than by listening. To begin with they thought it was the job of the teacher to talk, and the duty of the students to listen. For this reason, the early demonstration lessons were very long, and it was only after the teachers had observed the television lesson, one third of which is devoted to presentation, and two-thirds to student practice, that they realised it was better if teacher-talk could be kept to a minimum and student-practice extended. They could see that this practice was based on eliciting answers from individuals and groups of students, but that this could only be successful if the instructions given to the students were exact. It was not the job of the teacher to try to catch his students out, but to guide them to make correct answers in their oral and written exercises.

Throughout the course there was a growing awareness that all the presentations whether on television or in the classroom could be improved, and an increasing ability to make constructive criticism of materials and of the ways in which lessons were presented.

By the end of the course, the standard of teaching had improved partly because the student-teachers began to copy the example of the television teacher. It was felt that if television was introduced into the conventional classroom, it would indeed become a form of in-service training.

But television cannot supplant other methods of training, it can only supplement them. It would be best if it could be used both in initial and in-service training courses which were staffed by expert teachers who could guide the course and lead the discussion. Student-teachers could then present lessons on television which could be viewed, discussed and modified. They could also watch their fellows teaching in the classroom without disturbing the class and they could learn to use the television broadcast as part of their own lessons; and this might, in turn, lead to the continued improvement of their own teaching.

PART 11

THE STATISTICAL REPORT

The purpose of this part of the report is to evaluate the results obtained from three experiments in which adults of limited education were taught through the medium of television. The evaluation is based on the measurement of attainment in English and Arithmetic over the period of each experiment.

In more specific terms, the aim of this part of the report is to evaluate the effectiveness of closed-circuit television as an educational aid in teaching simple English and Arithmetic to groups of adult men on the Copperbelt who claimed less than three years of formal education. This evaluation is made by comparing the progress of groups of students taught through the medium of television with the progress of students taught in conventional classes at Rhokana Corporation's Adult Education Centres.

CHAPTER 1

DESIGN OF THE THREE EXPERIMENTS

The three experiments are described in this report as Experiment One, a pilot experiment, in which techniques of teaching English and Arithmetic through the medium of television were tried out; Experiment Two, a refinement of the first experiment, in which an attempt was made to improve techniques of presentation as a result of the experience gained in Experiment One; and Experiment Three, the main experiment, in which comparisons were made between three groups of students subjected to different treatments at the Television Centre and a fourth group taught in conventional classes.

For comparative purposes, particularly with Experiments One and Two, a statistical sample of 35 students was drawn from three Adult Education Centres at Rhokana Corporation. This statistical sample, described as the Standard One Sample, was taught in conventional classes at the Adult Education Centres. In each experiment an attempt was made to match the experimental samples with the Standard One Sample, and then to compare the progress made by the students in this sample with the progress of the students in the three experiments. The progress of each sample was determined by attainment tests in English and Arithmetic.

The information that follows relates to the selection of the samples for the research project, the data used in matching the samples, the tests and test procedures, the statistical procedures, the form of each television lesson, and the timing of the research project.

The Samples

The students in the various samples were all adult men employed by Rhokana Corporation. The Standard One Sample, comprising 35 students, was drawn from three Adult Education Centres at Rhokana Corporation - Wusikili, Mindola and Chamboli. The students for the three experiments, ranging in number from 13 to 20 students, came from this source and also from the Mechanics' Training Courses run by the Training Department at Rhokana Corporation.

The students drawn from the Adult Education Centres attended classes on a voluntary basis, whereas those from the Mechanics' Training Courses were required to attend classes as part of their training course.

The small number of students in the experimental samples, caused by drop out and the difficulty of obtaining day-release students, gave rise to serious problems in matching the samples and in assessing the relative progress made by the experimental samples. This in turn placed limitations on the conclusions that could be drawn from each experiment.

Data Used in Matching the Samples

An attempt was made to match the samples in the three experiments with the Standard One Sample on the basis of English and Arithmetic attainment and non-verbal ability. In Experiment Three it was found that the number of years of formal education claimed by the students should also be taken into account in matching the four samples in this experiment. Since Experiment Three included its own statistical sample, it was not entirely necessary to match the four samples in this experiment with the Standard One Sample. However, it was felt that a comparison of all the samples in the research project, if this proved possible, should provide additional useful information, particularly in determining whether each experiment had gained from the one before.

The tests used in matching the samples are described below.

Tests and Test Procedures

Biographical Data Questionnaire

All the students in the experimental samples were asked to provide answers to a questionnaire under the following headings :

(a) Age;
(b) Length of service claimed on the Copperbelt;
(c) Claimed educational standard;
(d) Tribe.

It must be stressed that it was impossible to test the veracity of any of the answers given as there were no complete records available. All information was provided through the classroom teacher or the teachers at the Television Centre.

The Biographical Data Questionnaire was not administered to the students in the Standard One sample.

All the samples were pre-tested by the following tests:

Raven's Progressive Matrices (1938) Test In matching the samples, it was felt that it would be necessary to test each sample in a way which would indicate the non-verbal ability of the students. For this purpose Raven's Progressive Matrices test was used. This test has been found to provide an estimate of general intellectual ability without requiring the person tested to demonstrate his skill with words and numbers (MacArthur, Irvine and Brimble, 1964).

Educational Attainment Grading Tests[1] These are tests which have been developed by J.H.F. Kemp for Rhokana Corporation. The purpose of the tests is to indicate achievement in English and Arithmetic as measured against normal progress in primary schools. These tests, including the alternative forms which have been developed (tests A and B), allow for completely objective marking and have been used to grade students at the Adult Education Centres. The tests have not been standardized in any strict statistical sense, but norms relating to primary school grades have been established. These are described below.

The initial intake at the Adult Education Centres is approximately at the Grade II level of the Zambian Primary Schools (prior to 1964 this was called Sub B). Grades II to VIII (Sub B to Standard 6) are divided by the Educational Attainment Grading Tests into six grades. Scores relating to these grades are indicated in the following tables :

ENGLISH TESTS A AND B

GRADING TABLE

SCORE	EDUCATIONAL ATTAINMENT GRADING TEST RATING	PRIMARY SCHOOL GRADES
Below 3	Nil	II
3 - 12	1	III
13 - 22	2	IV
23 - 32	3	V
33 - 42	4	VI
43 - 52	5	VII
53 - 62	6	VIII

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[1] Permission to use these tests must be obtained from the General Manager, Mining and Service Division, Rhokana Corporation, P.O. Box 2000, Kitwe, Zambia.

ARITHMETIC TESTS A AND B

GRADING TABLE

SCORE	EDUCATIONAL ATTAINMENT GRADING TEST RATING	PRIMARY SCHOOL GRADES
Below 3	Nil	II
3 - 12	1	III
13 - 22	2	IV
23 - 32	3	V
33 - 42	4	VI
43 - 52	5	VII
53 - 62	6	VIII

At the end of the courses at the Adult Education Centres and at the Television Centre, the samples were tested again to determine the progress made in English and Arithmetic For this purpose alternative forms of the Educational Attainment Grading tests (tests B) were administered to reduce the practice effect of taking similar tests to those used in pre-testing the samples.

Reliability Coefficients Estimates of the reliability of the Raven Progressive Matrices test and the Educational Attainment Grading tests, as calculated on the formula $Rtt = 1 - 19/V$ (where $K =$ no. of items and $V =$ variance),
for the 35 students in the Standard One Sample are shown in the table below.

Tests	Reliability Est.
Raven Progressive Matrices	0.62
EAG English test A	0.84
EAG English test B	0.70
EAG Arithmetic test A	0.88
EAG Arithmetic test B	0.76

Statistical Procedures

Tests for significance, used in matching the samples in the three experiments and for comparison of the gains made by the various samples, were based on the median test as described by Ferguson (1959). Since this is a nonparametric test, it was considered to be more suitable for comparative purposes than F and t tests, particularly in view of the considerable variation in the size of the samples. The median test involves finding a common median for the two samples being compared and then assigning + and - signs to cases above and below the common median. Next, a Chi square test is used to determine whether the observed frequencies of + and - signs depart significantly from expectation under the null hypothesis. The Chi square formula that was used is given below.

$$x^2 = \frac{N\,(ad - bc - \frac{N}{2})^2}{(a+b)\,(c+d)\,(a+c)\,(b+d)} \quad \text{With Yates's correction}$$

$$\text{or} \quad \frac{N\,(ad - bc)^2}{(a+b)\,(c+d)\,(a+c)\,(b+d)}$$

Note: With 1 df, Yates's correction for continuity was applied when any cell frequency was less than 10 (Guilford, 1956).

F and t tests were used to test the significance of the progress made by each sample since the power of these tests is greater than that of the median test. The F test was employed merely as a check on the t test in cases where the samples were small. The t formula for testing the difference between uncorrelated means was used.

$$t = \frac{M_1 - M_2}{\sqrt{\dfrac{\sum x_1^2 + \sum x_2^2}{N_i\,(N_i - 1)}}} \quad \text{(For samples of equal size)}$$

It was only in Experiment Three, the main experiment, that the samples were matched on variables shown to correlate with English and Arithmetic attainment. For this purpose the Pearson product-moment coefficient of correlation was used.

$$r_{xy} = \frac{N\Sigma XY - (\Sigma X)\ (\Sigma Y)}{\sqrt{\left[N\Sigma X^2 - (\Sigma X)^2\right]\left[N\Sigma Y^2 - (\Sigma Y)^2\right]}}$$

(Pearson r computed from original date)

The Form of the Television Lesson

Each session at the Television Centre, described in the three experiments as the television lesson, was divided into three parts. During the first part, the warming-up period, the students were prepared for the broadcast by the classroom teacher; during the second part, the broadcast, they were taught new material by the television teacher who was assisted in the classroom by the classroom teacher; during the third part, the follow-up period, they were provided with reinforcement of the broadcast material by the classroom teacher. The warming-up period, which was thought necessary in Experiments One and Two, was omitted in Experiment Three without detrimental results.

In each one-hour television lesson, the broadcast occupied about one third of the time and the session with the classroom teacher about two thirds of the time. A more detailed account of the television lesson is given in Part I, Chapter 5.

Timing of the Research

The three experiments took place at the following times:-

Experiment One.	July 7th, 1964 to September 16th, 1964 - 10 weeks
Experiment Two.	November 30th, 1964 to February 12th, 1965 - 10 weeks
Experiment Three.	March 14th, 1965 to May 28th, 1965 - 10 weeks.

The delay in starting the series of experiments was primarily due to the delay in delivery and installation of equipment at the Television Centre.

The delay between experiments was due to the difficulties involved in the provision of students. Both delays were out of the hands of the Research Fellow.

CHAPTER 2

THE THREE EXPERIMENTS

This chapter is primarily concerned with a description and statistical analysis of the three experiments in the research project. It deals with each sample in the project in turn, starting with the Standard One Sample, and describes the selection, main characteristics, pre-testing, treatment, and post-testing of each sample. Then follows an assessment of the progress made by each sample and the extent to which this progress compares with that made by the Standard One Sample and other samples in the three experiments.

THE STANDARD ONE SAMPLE

The Standard One Sample, comprising 35 students, was drawn from the 1964 intake of students at Rhokana Corporation's three Adult Education Centres - Wusikili, Mindola, and Chamboli. This sample was not an actual class grouping, but simply a statistical sample within the total Standard One intake at the Adult Education Centres. The purpose of the sample was to give an indication of the normal progress made by students in the conventional adult education classes over a period of 40 weeks.

In all three experiments, an attempt was made to match the experimental samples with the Standard One Sample as a basis for evaluating the television programmes.

1. Selection of the Sample

The sample in Standard One at the three Adult Centres of Wusikili, Mindola and Chamboli consisted of those students who had completed a year in one of these centres during 1964. Only students for whom Educational Attainment Grading test scores were available in both English and Arithmetic at the commencement of the course and at the conclusion were considered. Of a total enrolment of 193 only 35 students qualified for the sample. Thus the Standard One Sample turned out to be a somewhat highly selected group and did not provide a fully representative sample of the students at the Adult Education Centres.

2. Characteristics of the Sample

The main characteristic of the sample was that they were all men employed by Rhokana Corporation. Their attendance at the Adult Education Centres was entirely voluntary.

3. Pre-Testing

The results obtained by the sample on the Educational Attainment Grading tests in English and Arithmetic at the commencement of the course at the Adult Education Centres are shown in Appendix A, Table A.1., together with their results on the Raven Progressive Matrices test.

4. Treatment

The sample attended conventional classes at the Adult Education Centres for a period of 40 weeks. There were five sessions of two hours per week, Monday to Friday. Each session consisted of one hour in English and one hour in Arithmetic.

The content of the courses in English and Arithmetic was based on the same books as were used at the Television Centre - New Ship English and Zambia Arithmetic.

The sample was taught by teachers with the same academic qualifications as the two teachers at the Television Centre, that is, two years secondary education and two years teacher training. On the whole the three teachers at the Adult Education Centres were more experienced and, therefore, tended to be more conservative, than the two teachers at the Television Centre.

5. Post-Testing

The results obtained by the 35 students on alternative forms of the English and Arithmetic Educational Attainment Grading tests administered at the end of the course at the Adult Education Centres appear in Appendix A, Table A. 2.

6. Incremental Gain of the Standard One Sample

The incremental gains on the Educational Attainment Grading tests in English and Arithmetic achieved by each individual in the sample are shown in Appendix A, Table A. 3.

The pre- and post-test scores were compared (see Table 1, below) to determine whether the sample had shown any appreciable gain in English and Arithmetic as a result of the course at the Adult Education Centres.

Table 1 : Significance of the gain made by the Standard One Sample on the Educational Attainment Grading Tests in English and Arithmetic, as determined by t-test of a difference between means (N=35).

	Mean		Diff.	S.D.		t	df	Probability
	Pre.	Post.		Pre.	Post.			
English	19.7	28.2	8.5	8.5	6.3	4.65	68	less than 0.1%
Arithmetic	17.6	16.7	- 0.9	9.7	7.0	0.43	68	greater than 50%

These results indicate that over a period of 40 weeks, with 5 hours of conventional teaching per week in each subject, the sample in Standard One at the Adult Education Centres in 1964 showed a significant gain in English, but no gain in Arithmetic.

EXPERIMENT ONE

Experiment One, the pilot experiment, had two aims. The first aim was to try out a series of television lessons in English and Arithmetic on a class of 18 men and to assess their progress over a period of ten weeks. The experience gained from this trial would provide grounds for revising the television lessons for the main experiments to follow. The second aim was to compare the results of this sample with the results of the Standard One Sample described previously, if this was at all possible.

1. Selection of the Sample

a) Circumstantial The only students available for the first experiment were from a Mechanics' Training Course at Rhokana Corporation. The selection for this course was based on the recommendation of departmental heads and on the availability of the workers.

b) Tests After the men had been chosen for the Mechanics' Training Course they were tested by means of the Educational Attainment Grading tests. The 18 students with the lowest EAG test scores were allocated to the Television Centre by the Chief Training Officer at Rhokana Corporation.

2. Characteristics of the Sample

The main characteristic of the sample was that they were all men employed by Rhokana Corporation. Their attendance at the Mechanics' Training Course and the English and Arithmetic course at the Television Centre was compulsory.

The biographical data relating to the sample in Experiment One appears in Appendix B, Table B. 1. This information can be summarised as follows:

Age The average age of the sample was 39.7 years. This average was probably higher than the average for all employees at Rhokana Corporation. Possibly the reason for this was that only experienced workers were chosen for the Mechanics' Training Course.

Length of Service The average length of service on the mines of the sample was 9.7 years. This was probably slightly higher than the average for all employees at Rhokana Corporation. This figure indicates not only the time the individuals in the sample had served at Rhokana Corporation, but also the total time served on all mines on the Copperbelt. These figures cannot be judged to be accurate because there was no means of verifying these claims.

Standard Claimed Although the sample appeared to be homogeneous as regards the claimed standard of education, no great reliance could be placed on these figures as there was no means of checking them.

Tribe. The sample did not appear to contain a disproportionate number from any one tribe. No comparison with the wider sample of the Copperbelt labour force was feasible on account of lack of data for that sample. There is no evidence that tribal affiliation influences intellectual capacity.

3. Pre-Testing

The results on the Educational Attainment Grading tests in English and Arithmetic of the 18 students allocated to the Television Centre are shown in Appendix B, Table B. 2., together with their results on the Raven Progressive Matrices test.

4. Treatment

The sample of 18 students attended 50 sessions at the Television Centre over a period of 10 weeks. There were 5 sessions each week, Monday to Friday. Each session consisted of one hour of English and one hour of Arithmetic. The English lessons took place first in each session. The content of the broadcasts appears in Appendix [illegible] and the duration of the broadcasts in Appendix F. The form of the television lessons is described on page 45. Prior to the course at the Television Centre the sample had received no formal instruction in English and Arithmetic.

5. Post-Testing

At the end of the course at the Television Centre the 18 students were tested on alternative forms of the English and Arithmetic Educational Attainment Grading tests. These results are shown in Appendix B, Table B. 3.

The practice effect of taking similar tests to those used in pre-testing the sample was considered to be negligible. The reasons underlying this assumption were that the Educational Attainment Grading tests were not directly related to the content of the course at the Television Centre; the use of alternative forms of objective tests reduced the practice effect (Anastasi, 1962); and the time lapse of ten weeks between testing would further reduce the effects of the sheer repetition of similar tests.

6. Incremental Gain of the Sample in Experiment One

The incremental gains on the Educational Attainment Grading tests in English and Arithmetic achieved by each individual in the sample appear in Appendix B, Table B. 4.

The pre- and post-test scores were compared (see Table 2, below) to determine whether the sample had shown any appreciable gain in English and Arithmetic as a result of the course at the Television Centre.

Table 2 : Significance of the gain made by the sample in Experiment One on the Educational Attainment Grading Tests in English and Arithmetic, as determined by t-test of a difference between means (N=18).

	Mean Pre.	Mean Post.	Diff.	S.D. Pre.	S.D. Post.	t	df	P
Eng.	17.8	25.5	7.7	11.7	8.7	2.19	34	2 - 5%
Arith.	9.5	13.6	4.1	5.8	6.4	1.93	34	5 - 10%

These results indicate that over a period of 10 weeks, with 5 one-hour sessions at the Television Centre per week in each subject, the sample in Experiment One showed a gain in English which was significant at the 5% level of confidence. The gain in Arithmetic, on the other hand, just failed to reach significance at the 5% level.

7. Retention

The sample was tested for retention by administering alternative forms of the Educational Attainment

Grading tests three weeks after the completion of the course at the Television Centre. The results of this testing appear in Table 3.

Table 3 : **Retention of the sample in Experiment One expressed as a comparison, by t-test, between results obtained on the EAG Tests at the end of the course (columns X) and three weeks later (columns Y).**

	Mean		Diff.	S.D.		t	df	P
	X	Y		X	Y			
Eng.	25.6	27.0	1.4	8.7	8.1	1.30	34	20%
Arith.	13.6	15.0	1.4	6.4	6.1	0.68	34	50%

The sample received no formal instruction in English and Arithmetic between the end of the course at the Television Centre and the final Educational Attainment Grading tests administered three weeks later.

The t-test results show that there were no significant differences between the means of the scores on the two EAG tests in both English and Arithmetic, indicating no significant changes in the level of attainment over the retention period of three weeks. The fact that there were slight increases in the means over this period was probably due to familiarity with the tests.

8. Comparison of Progress Between the Sample in Experiment One and the Standard One Sample

(i) The results obtained by the sample in Experiment One at the commencement of the Mechanics' Training Course were compared with the pre-test results obtained by the Standard One Sample to determine whether the samples were matched in terms of English and Arithmetic attainment and non-verbal ability (Raven's Progressive Matrices test).

Table 4 : **Comparison, by median test, of the pre-test results of the samples in Experiment One (N=18) and Standard One (N=35).**

	Chi Square	Probability
English	0.00	99%
Arithmetic	1.34	20 - 30%
Progressive Matrices	5.43	2%

Note: (a) Yates's correction for continuity was applied in the above table.

(b) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

(ii) These calculations show that there was no significant difference between the samples in English and Arithmetic attainment, but on the Progressive Matrices test the difference was significant at the 5% level of confidence, indicating that the samples were not matched on non-verbal ability. Unfortunately it was not possible to change the experimental sample as the only students available for Experiment One had been pre-selected for a Mechanics' Training Course by Rhokana Corporation. This discrepancy in the matching of the two samples has been taken into account in the conclusions on page 54.

(iii) The incremental gains achieved by the sample in Experiment One and the Standard One Sample were compared to determine whether there were any significant differences between the two samples in English and Arithmetic attainment.

Table 5 : Comparison of the incremental gains, by median test, made by the samples in Experiment One and Standard One.

	No. in Sample		Mean			S.D.		Chi	
	Expt.I	Std.I	Expt.I	Std.I	Diff.	Expt.I	Std.I	Square	P (%)
Eng.	18	35	7.7	8.5	-0.8	6.6	11.2	0.33	50-70
Arith.	18	35	4.1	-0.9	+5.0	3.0	14.4	0.04	80-90

Note: (a) Yates's correction for continuity was applied in the above table.

(b) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

(iv) These results indicate that there were no statistically significant differences between the incremental gains made by the sample in Experiment One and the Standard One Sample on both the English and Arithmetic Educational Attainment Grading tests.

9. Conclusion

Although the gains in English and Arithmetic made by the two samples were not significantly different, the gain made by the sample in Experiment One was achieved in 10 weeks (100 hours) whereas the gain made by the sample in Standard One at the Adult Education Centres in 1964 was achieved in 40 weeks (400 hours). It could thus be argued that the progress of the sample in Experiment One was four times as fast as the progress of the Standard One Sample. This is particularly noticeable in Arithmetic achievement. However, the fact that the samples were not matched on non-verbal ability could be considered to invalidate this argument. The Raven Progressive Matrices is usually regarded as being a measure of general intellectual ability. Thus, since the sample in Experiment One did considerably better than the Standard One Sample on this test, it could also be argued that the Experiment One sample might be expected to be superior in learning ability. It is quite clear, then, that a comparison of the results obtained by the two samples has to be interpreted with caution.

EXPERIMENT TWO

In Experiment Two, 18 men attended Classes in English and Arithmetic at the Television Centre over a period of ten weeks. The design of the experiment was similar to that of the first experiment except that the methods of presenting the broadcasts had been revised as a result of the experience gained in the pilot experiment.

The aim of Experiment Two was to compare the progress made by the sample in this experiment with the progress of the samples in Standard One and in Experiment One.

1. Selection of the Sample

a) Circumstantial The only students available for the second experiment were from a Mechanics' Training Course at Rhokana Corporation. The selection for this course was based on the recommendation of departmental heads and on the availability of the workers.

b) Tests After men had been chosen for the Mechanics' Training Course, they were tested by means of the Educational Attainment Grading Tests. 18 students were then allocated to the Television Centre by the Chief Training Officer at Rhokana Corporation.

2. Characteristics of the Sample

The main characteristic of the sample was that they were all men employed by Rhokana Corporation. Their attendance at the Mechanics' Training Course and the English and Arithmetic course at the Television Centre was compulsory.

The biographical data relating to the sample in Experiment Two appears in Appendix C, Table C. 1. This information can be summarised as follows:

Age The average age of the sample was 31.5 years. This average was probably near the average for all employees at Rhokana Corporation.

Length of Service The average length of service on the mines of the sample was 5.8 years. This was probably slightly lower than the average for all employees at Rhokana Corporation. This figure indicates not only the time the individuals in the sample had served at Rhokana Corporation, but also the total time served on all mines on the Copperbelt. These figures cannot be judged to be accurate because there was no means of verifying these claims.

Standard Claimed Although the sample appeared to be homogeneous as regards the claimed standard of education no great reliance could be placed on these figures as there was no means of checking them.

Tribe The sample did not appear to contain a disproportionate number from any one tribe. No comparison with the wider sample of the Copperbelt labour force was feasible on account of lack of data for that sample. There is no evidence that tribal affiliation influences intellectual capacity.

3. Pre-Testing

The results on the Educational Attainment Grading tests in English and Arithmetic of the 18 students allocated to the Television Centre are shown in Appendix C, Table C. 2., together with their results on the Raven Progressive Matrices test.

4. Treatment

The sample of 18 students attended 51 sessions at the Television Centre over a period of 10 weeks. There were approximately 5 sessions each week, Monday to Friday. Each session consisted of one hour of English and one hour of Arithmetic. The English lessons took place first in each session. The content of the broadcasts appears in Appendix E and the duration of the broadcasts in Appendix F. The form of the television lessons is described on page 45. Prior to the course at the Television Centre the sample had received no formal instruction in English and Arithmetic.

5. Post-Testing

At the end of the course at the Television Centre the 18 students were tested on alternative forms of the English and Arithmetic Educational Attainment Grading tests. These results are shown in Appendix C, Table C. 3.

The practice effect of taking similar tests to those used in pre-testing the sample was considered to be negligible for the reasons given earlier.

6. Incremental Gain of the Sample in Experiment Two

The Incremental Gains on the Educational Attainment Grading tests in English and Arithmetic achieved by each individual in the sample appear in Appendix C, Table C. 4.

The pre- and post-test scores were compared (see Table 6, below) to determine whether the sample had shown any appreciable gain in English and Arithmetic as a result of the course at the Television Centre.

Table 6 : Significance of the gain made by the sample in Experiment Two on the Educational Attainment Grading Tests in English and Arithmetic, as determined by t-test of a difference between means (N=18)

	Mean			S.D.				
	Pre.	Post.	Diff.	Pre.	Post.	t	df	P
English	20.7	32.9	12.2	8.2	6.5	4.85	34	less than 0.1%
Arithmetic	11.9	15.5	3.6	2.8	5.3	2.44	34	2%

These results indicate that over a period of 10 weeks, with a total of 51 one-hour sessions at the Television Centre in each subject, the sample in Experiment Two showed a gain in both English and Arithmetic which was significant at the 5% level of confidence.

7. Comparison of Progress Between the Samples in Experiments One and Two and the Standard One Sample

(i) The results obtained by the sample in Experiment Two at the commencement of the course at the Television Centre were compared with the pre-test results obtained by the Standard One Sample and the sample in Experiment One to determine whether the samples were matched in terms of English and Arithmetic attainment and non-verbal ability.

Table 7 : Comparison, by median test, of the pre-test results of the samples in Experiments Two (N=18), One (N=18), and Standard One (N=35).

Note: (i) The tables below give Chi square and approximate probability values.

(ii) Yates's correction for continuity was applied in each case.

(iii) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

ENGLISH

	Expt. Two	Expt. One
Expt. One	0.01 90%	
Std. One	0.00 99%	0.00 99%

ARITHMETIC

	Expt. Two	Expt. One
Expt. One	1.01 30%	
Std. One	3.06 5-10%	1.34 20-30%

PROGRESSIVE MATRICES

	Expt. Two	Expt. One
Expt. One	3.66 5-10%	
Std. One	0.00 99%	5.43 2%

(ii) The table above shows that except for the significant difference, previously reported, between the Standard One and Experiment One samples on the Progressive Matrices test, there were no significant differences between the three samples and they could thus be considered to be matched on English and Arithmetic attainment and non-verbal ability.

(iii) The incremental gain achieved by the sample in Experiment Two was compared with the incremental gains achieved by the samples in Experiment One and Standard One to determine whether the improved methods of presentation had resulted in any significant differences in English and Arithmetic attainment.

Table 8 (a) : Comparison of the incremental gains made by the samples in Experiment Two, Experiment One, and Standard One.

	No. in Sample			Mean			Standard Deviation		
	Expt. 2.	Expt. 1.	Std. 1.	Expt. 2.	Expt. 1.	Std. 1.	Expt. 2.	Expt. 1.	Std. 1.
Eng.	18	18	35	12.2	7.7	8.5	5.7	6.6	11.2
Arith.	18	18	35	3.6	4.1	-0.9	5.5	3.0	14.4

Table 8 (b) : Comparison of the incremental gains, by median test, made by the samples in Experiment Two, Experiment One, and Standard One.

Note: (i) The tables below give Chi square and approximate probability values.

(ii) Yates's correction for continuity was applied in each case.

(iii) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

ENGLISH

	Expt. Two	Expt. One
Expt. One	2.78 10%	
Std. One	0.62 30-50%	0.33 50-70%

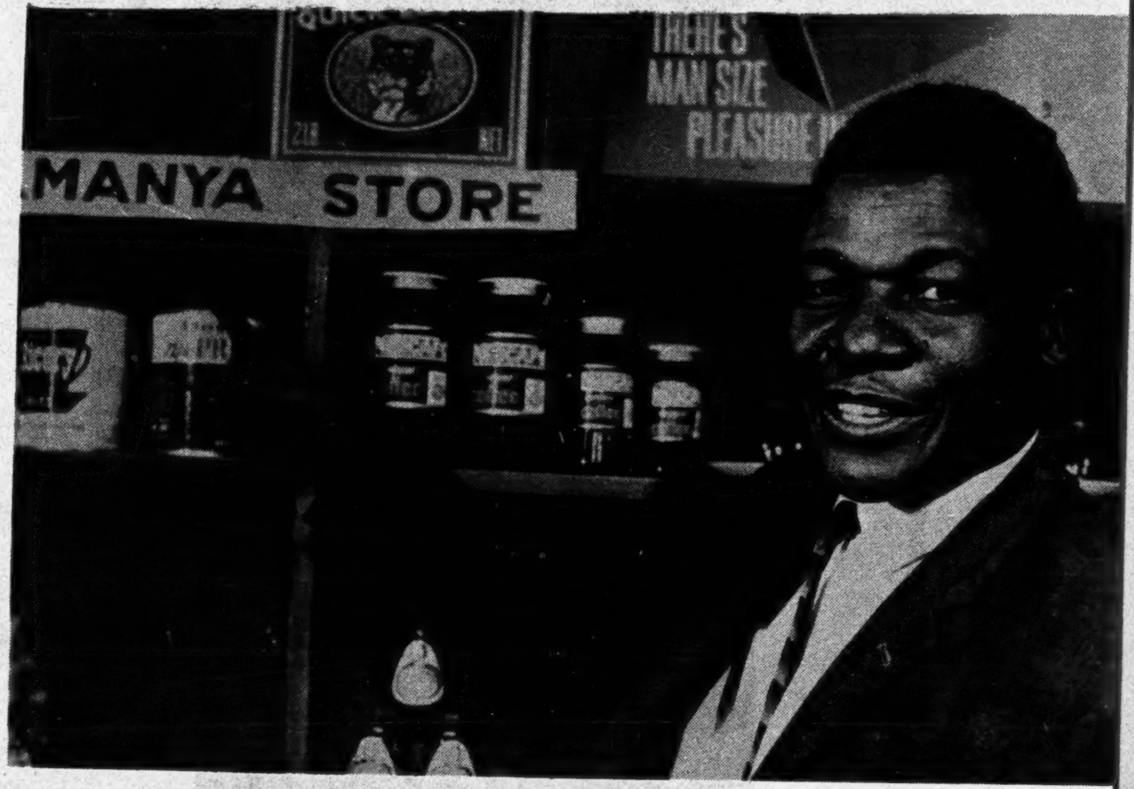
ARITHMETIC

	Expt. Two	Expt. One.
Expt. One	1.01 30%	
Std. One	0.00 99%	0.04 80-90%

(iv) These results indicate that there were no significant differences, at the 5% level of confidence, between the incremental gains made by the sample in Experiment Two and the samples in Experiment One and Standard One on both the English and Arithmetic Educational Attainment Grading tests.

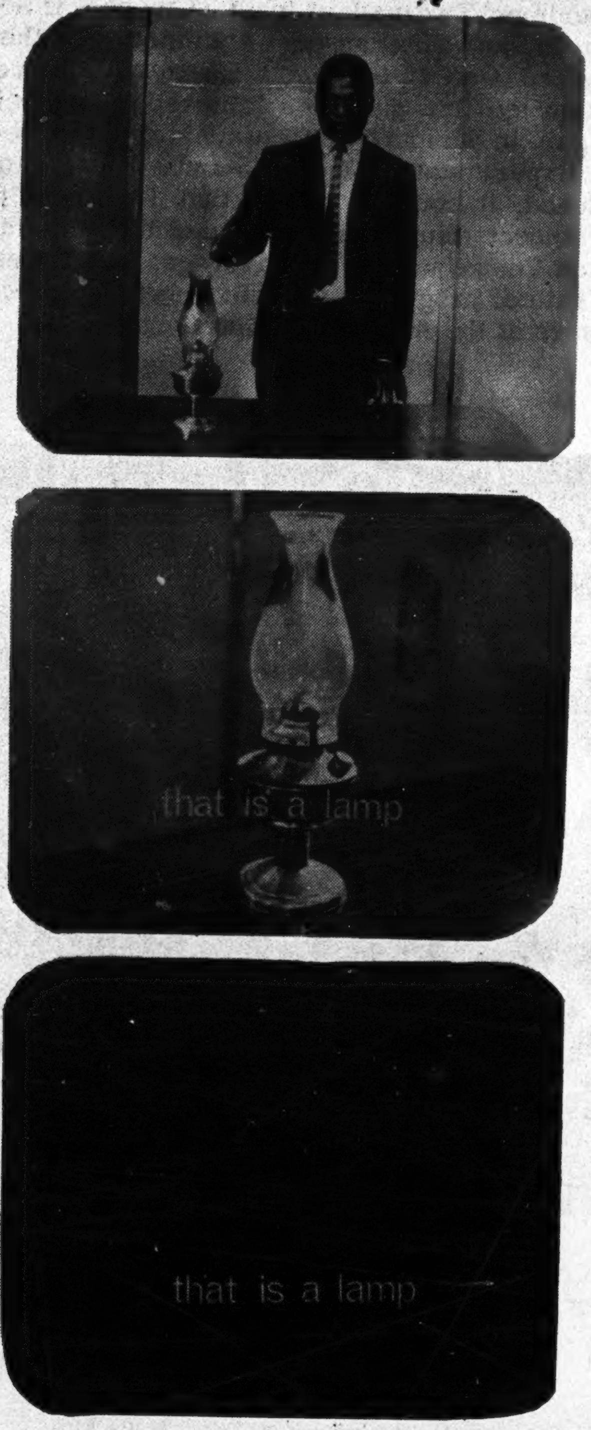
8. Conclusion

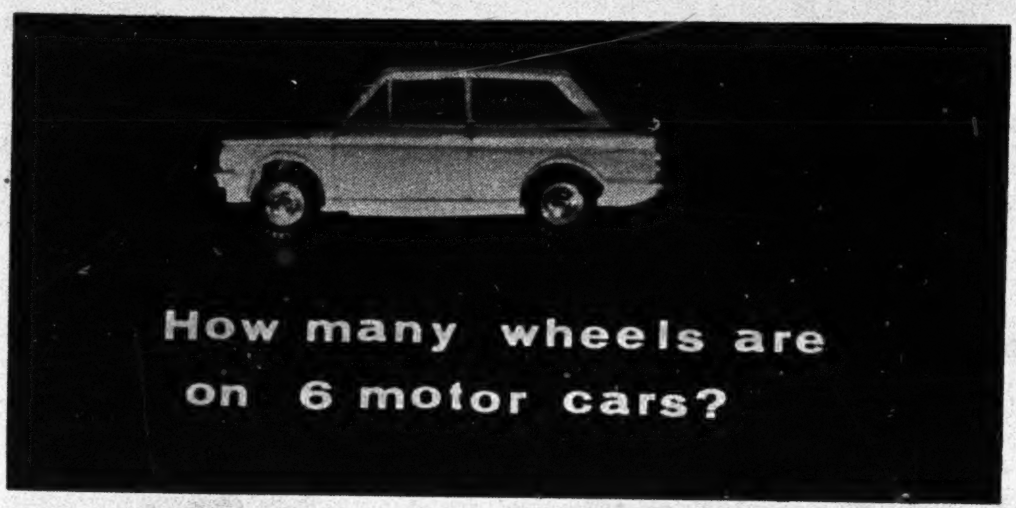
It appears that the samples in Experiment One and Experiment Two made at least as much - if not greater - gain in both English and Arithmetic as the sample in Standard One at the Adult Education Centres in 1964. In addition this gain was achieved in 10 weeks whereas the gain in Standard One was achieved in 40 weeks. Since the Experiment Two and Standard One samples were matched, it could be argued that the rate of progress of the students taught with the aid of television at the Television Centre was, on the average, four times as fast as the rate of progress of the students taught in conventional classes at the Adult Education Centres.



Enoch Shamatutu in his store. This was a feature of the arithmetic programmes dealing with money

The use of a superimposition sequence in an English language programme.

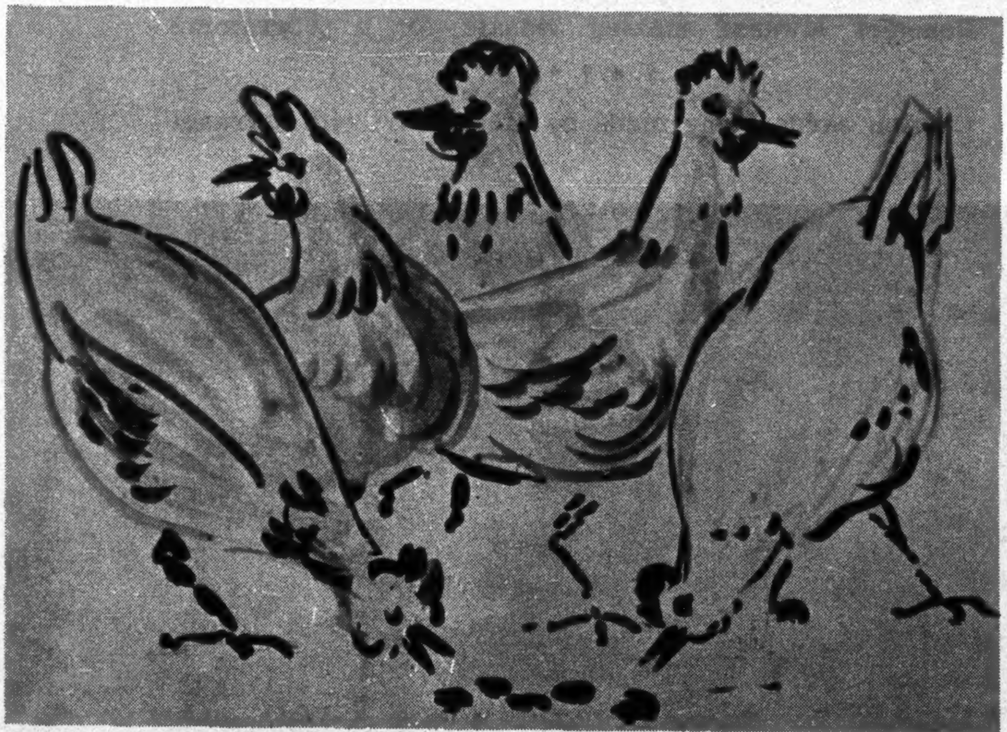

that is a lamp
that is a lamp

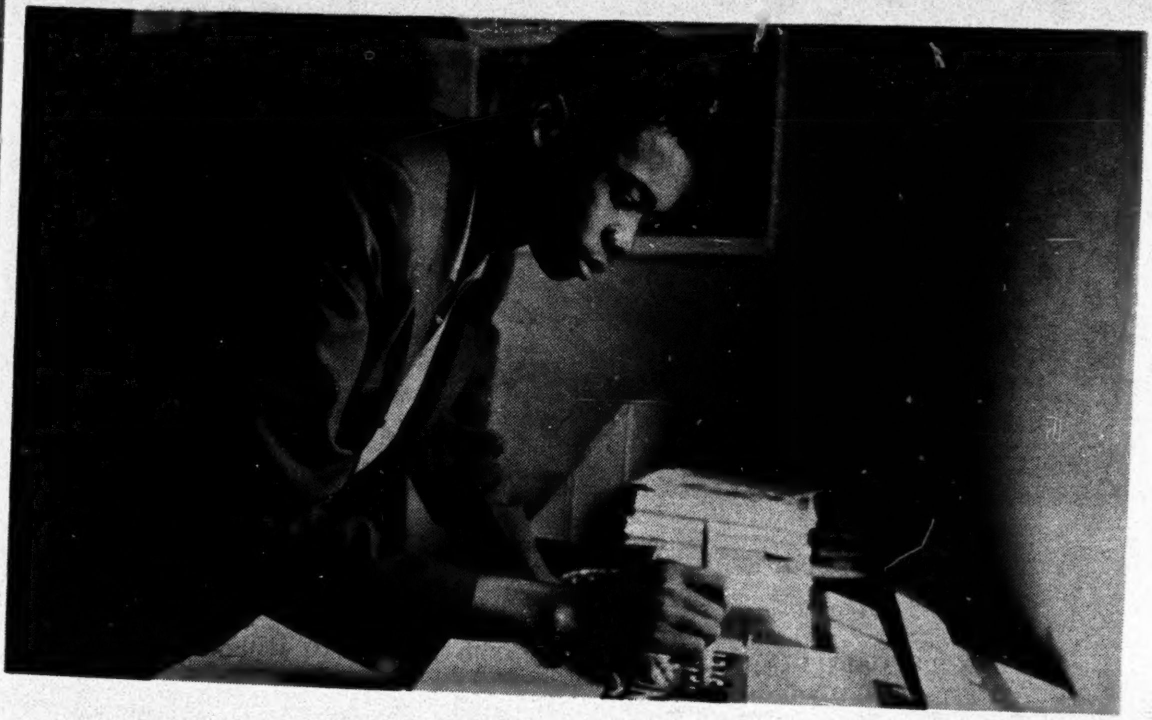

How many wheels are on 6 motor cars?

A problem in arithmetic illustrated with a model

* * * * * *

A cartoon drawn by the Research Fellow to illustrate a problem in arithmetic.

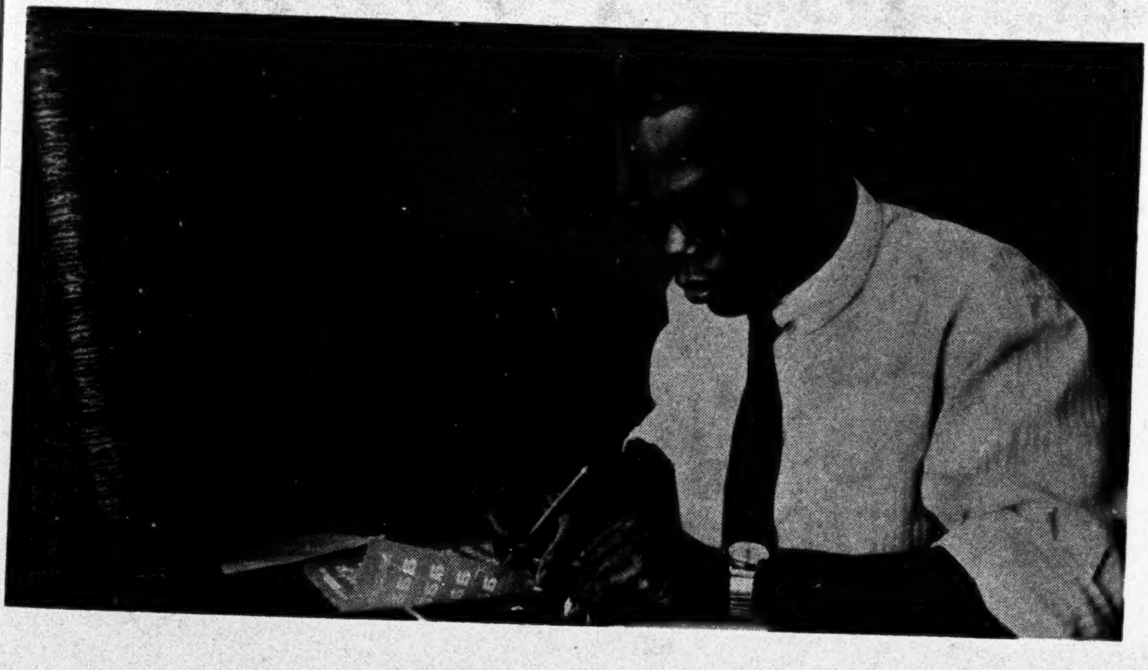




Benedict Mwanza making visuals for a programme

* * * * * * *

Caption cards being made by Moses Piri with Letraset



II C.

EXPERIMENT THREE

In Experiment Three, the main experiment, the presentation of the broadcasts was revised following the experience of Experiments One and Two. The general design of the experiment was similar to that of the previous experiments except that in this experiment there were four samples. Three of these samples were taught at the Television Centre, while a fourth sample, the statistical sample, was taught at two Adult Education Centres. The experiment took place over a period of ten weeks.

Experiment Three had two aims. The first aim was to compare the progress made by the four samples in the experiment where each sample, previously matched as far as was possible, was subjected to a different treatment. The second aim was to compare the progress of the four samples in Experiment Three with the progress of the samples in Experiments One and Two and the Standard One Sample, if this was possible.

1. Selection of the Samples

The samples for Experiment Three came from two separate sources:

(i) 20 students from a Mechanics' Training Course at Rhokana Corporation. The selection for this course was based on the recommendation of departmental heads and on the availability of the workers.

(ii) The Standard One intake in February, 1965, at Rhokana Corporation's Adult Education Centres at Wusikili and Mindola. This intake consisted of 80 students at Wusikili and 70 students at Mindola - a total of 150 students. Priority was given to adults who were employed by Rhokana Corporation to register for the Standard One intake.

2. Characteristics of the Samples

The main characteristic of the samples from both sources was that they were all adult men employed by Rhokana Corporation.

The sample provided by the Mechanics' Training Course attended classes at the Television Centre as part of their training course and attendance was compulsory.

The samples from the Standard One intake at the Adult Education Centres attended the course at the Television Centre and at the Adult Education Centres on a voluntary basis.

3. Data Used in Matching

It was decided to match the four samples in Experiment Three on the basis of those variables that correlated significantly with the Educational Attainment Grading tests in English and Arithmetic since these were the measures used in comparing the progress of the samples. In determining the data to be used in matching the samples, the EAG test results of 87 students from the Standard One 1965 intake at the Wusikili and Mindola Adult Education Centres were compared with their replies to the Biographical Data Questionnaire and also with their performance on the Raven Progressive Matrices test. The degree of correlation between each of these variables appears in the table below.

Table 9 : Correlation of data obtained from a sample of 87 students enrolled for Standard One at Rhokana Corporation's Wusikili and Mindola Adult Education Centres in 1965.

	Age claimed	No. of years worked on Copperbelt	Formal education claimed	Progressive Matrices test results	English EAG test results	Arithmetic EAG test results
Eng. EAG test results	-0.16	-0.06	+0.39	+0.38	-	+0.31
Arith. EAG test results	-0.02	+0.05	+0.56	+0.34	+0.31	-

Note: (i) The table above gives Pearson r values computed from original data.

(ii) For this size of sample (with 85 df), an r of 0.21 is required for significance at the 5% level.

From these calculations it appears that only the following showed significant correlations at the 5% level of confidence:-

Tribe The samples did not appear to contain a disproportionate number from any one tribe. No comparison with the wider sample of the Copperbelt labour force was feasible on account of lack of data for that sample. There is no evidence that tribal affiliation influences intellectual capacity.

5. Pre-Testing

The results obtained by the students in the four samples on the Educational Attainment Grading tests in English and Arithmetic at the commencement of the courses at the Television Centre and at the Adult Education Centres are shown in Appendix D, Tables D. 5., D. 6., D. 7., and D. 8., together with their results on the Raven Progressive Matrices test.

6. Matching the Four Samples

The samples in Experiment Three were compared with respect to their pre-test results on the Educational Attainment Grading tests, their performance on the Raven Progressive Matrices test, and their claimed standard of formal education, to determine whether the four samples were matched on these criteria. The results of the calculations relating to these comparisons are given in tables 11 (a) and 11 (b) below.

Table 11 (a) : Comparison, by median test, of the four samples in Experiment Three on the EAG Tests (pre-test results) and the Progressive Matrices Test.

Note: (i) The tables below give Chi square and approximate probability values.

(ii) Yates's correction for continuity was applied in each case.

(iii) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

ENGLISH

	Sample One	Sample Two	Sample Three
Sample Two	0.00 98%		
Sample Three	0.10 70-80%	0.11 70-80%	
Sample Four	0.02 90%	0.83 30-50%	1.29 20-30%

ARITHMETIC

	Sample One	Sample Two	Sample Three
Sample Two	0.40 50-60%		
Sample Three	0.00 99%	0.11 70-80%	
Sample Four	0.00 99%	0.11 70-80%	0.09 70-80%

PROGRESSIVE MATRICES

	Sample One	Sample Two	Sample Three
Sample Two	0.13 70-80%		
Sample Three	0.40 50-60%	0.11 70-80%	
Sample Four	0.73 30-50%	0.03 80-90%	0.00 99%

Table 11 (b) : Comparison, by median test, of the claimed standard of formal education of the four samples in Experiment Three.

	Standard of Formal Education Claimed			
	Nil,Sub,A & B	Stds.I & II	Stds.III,IV & V	Total
Sample One				
Actual	6	10	4	20
Expected	7.6	8.7	3.8	20.0
Sample Two				
Actual	6	6	4	16
Expected	6.0	7.0	3.0	16.0
Sample Three				
Actual	10	8	2	20
Expected	7.5	8.7	3.8	20.0
Sample Four				
Actual	4	6	3	13
Expected	4.9	5.7	2.4	13.0
	Chi square = 2.98; 6df; Probability 80-90%			

Tables 11 (a) and 11 (b) above show that there were no statistically significant differences between the four samples in Experiment Three and they could thus be considered to be matched on English and Arithmetic attainment, non-verbal ability, and standard of formal education.

7. Treatment

(a) Sample One in Experiment Three This sample received instruction in the classroom at the Television Centre. The sample was taught by the television teacher through the medium of television. The content of the broadcasts appears in Appendix E and the duration of the broadcasts in Appendix F. The sample was taught in addition by a classroom teacher who followed up the broadcasts with the sample. The form of the television lessons is described on page 45.

(b) Sample Two in Experiment Three This sample received instruction in the classroom at the Television Centre. The sample was taught by the television teacher through the medium of television. The content of the broadcasts appears in Appendix E and the duration of the broadcasts in Appendix F. The treatment of this sample varied from the treatment of Sample One in that there was no classroom teacher. The form of the television lessons is described on page 50.

(c) Sample Three in Experiment Three Sample Three received instruction from a classroom teacher. This was the same teacher who followed up the broadcasts with Sample One in this experiment. Although no television was used, the materials and methods employed by the television teacher were available to the classroom teacher. The sample was taught at the Television Centre.

(d) Sample Four in Experiment Three Sample Four was taught by classroom teachers at the Adult Education Centres at Wusikili and Mindola. The content of the lessons was determined by the classroom teachers using the same books as those used at the Television Centre. This sample was not an actual class grouping, but simply a statistical sample within the total Standard One intake in 1965 at the Adult Education Centres. The purpose of this sample was to give an indication of the normal progress of students in the conventional adult education classes. The sample received instruction during either the morning or the evening depending upon the shifts worked by its members.

Time-Table Variation

Sample One	5.30 p.m. to 7.30 p.m.
Sample Two	5.30 p.m. to 7.30 p.m.
Sample Three	1.30 p.m. to 3.30 p.m.
Sample Four	8 a.m. to 10 a.m. or
	5 p.m. to 7 p.m.

8. Post-Testing

At the end of the courses at the Television Centre and at the Adult Education Centres the four samples were tested on alternative forms of the English and Arithmetic Educational Attainment Grading tests. These results are shown in Appendix D, Tables D. 9., D. 10., D. 11., and D. 12.

9. Incremental Gain of the Samples in Experiment Three

The pre- and post-test scores were compared (see Table 12 (a) below) to determine whether the samples had shown any appreciable gains in English and Arithmetic as a result of the courses at the Television Centre and at the Adult Education Centres.

Table 12 (a) : Significance of the gains made by the four samples in Experiment Three on the Educational Attainment Grading Tests in English and Arithmetic, as determined by t-test of a difference between means.

	Mean			S.D.				
	Pre.	Post.	Diff.	Pre.	Post.	t	df	P
Sample One (N 20)								
English	10.6	18.9	8.3	7.4	7.8	3.40	38	less than 0.2%
Arithmetic	7.3	16.9	9.6	4.5	7.0	5.04	38	less than 0.1%
Sample Two (N 16)								
English	11.9	20.7	8.8	8.6	6.5	3.17	30	less than 1%
Arithmetic	8.8	17.6	8.8	4.6	7.7	3.79	30	less than 0.1%
Sample Three (N 20)								
English	11.0	19.9	8.9	5.2	5.5	5.13	38	less than 0.1%
Arithmetic	8.5	14.5	6.0	5.5	4.6	3.62	38	less than 0.1%
Sample Four (N 13)								
English	13.2	19.7	6.5	7.3	7.6	2.14	24	2 - 5%
Arithmetic	8.1	14.5	6.4	4.2	8.2	2.39	24	2 - 5%

The incremental gains on the Educational Attainment Grading tests in English and Arithmetic made by each individual in the four samples in Experiment Three appear in Appendix D, Tables D. 13., D. 14., D. 15., and D. 16. These results were compared to determine whether the gains achieved by the four samples were statistically different (see Table 12 (b) below).

Table 12 (b) : Comparison of the incremental gains, by median test, made by the four samples in Experiment Three.

Note: (i) The tables below give Chi square and approximate probability values.

(ii) Yates's correction for continuity was applied in each case.

(iii) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

ENGLISH

	Sample One	Sample Two	Sample Three
Sample Two	0.11 70-80%		
Sample Three	0.00 99%	0.11 70-80%	
Sample Four	0.02 90%	0.86 30-50%	0.33 50-70%

ARITHMETIC

	Sample One	Sample Two	Sample Three
Sample Two	0.11 70-80%		
Sample Three	0.10 70-80%	0.11 70-80%	
Sample Four	0.70 30-50%	0.01 90-95%	0.21 50-70%

Conclusion (Tables 12 (a) and 12 (b))

The t-test results in Table 12 (a) indicate that over a period of 10 weeks all four samples in Experiment Three showed gains in both English and Arithmetic, as measured by the Education Attainment Grading tests, that were significant at the 5% level of confidence.

Although Table 12 (b) shows that there were no statistically significant differences between the gains made by the four samples, the descending order of gain appears to be as follows:-

a) **ENGLISH**

1. Sample Three (classroom teacher using television methods and materials)
2. Sample One (television teacher plus classroom teacher)
3. Sample Two (television teacher only)
4. Sample Four (classroom teachers at the Adult Education Centres)

b) **ARITHMETIC**

1. Sample One (television teacher plus classroom teacher)
2. Sample Two (television teacher only)
3. Sample Three (classroom teacher using television methods and materials)
4. Sample Four (classroom teachers at the Adult Education Centres)

10. General Conclusions

It appears that the teaching of English and Arithmetic at the Television Centre was more effective than the teaching of English and Arithmetic in conventional classes at the Adult Education Centres.

It appears that the teaching of English and Arithmetic by television without the assistance of a classroom teacher was less effective than the teaching of English and Arithmetic by television with the assistance of a classroom teacher. However, the difference in gain between these two methods appears to be not very great. It was obvious from attendances that the classroom teacher provided an additional factor in maintaining numbers and interest among the students.

In the teaching of English, it appears that when the methods used in the television broadcasts were applied in a conventional classroom they were more effective than when presented through the medium of television. This result in Experiment Three may be slightly artificial as Sample Three attended classes at the Television Centre as part of a Mechanics' Training Course and so were highly motivated to learn. The motivation to learn of the other three samples in this experiment cannot be considered to be as strong. In addition these samples attended on a voluntary basis only.

It appears that the least satisfactory method of teaching adults English and Arithmetic was the conventional classroom method employed at the Adult Education Centres.

11. Comparison of Progress Between All the Samples in the Three Experiments and the Standard One Sample

(i) The results obtained by the four samples in Experiment Three at the commencement of the courses at the Television Centre and at the Adult Education Centres were compared with the pre-test results obtained by the samples in Experiment One and Two and the sample in Standard One at the Adult Education Centres in 1964, to determine whether the samples were matched in terms of English and Arithmetic attainment and non-verbal ability.

Table 13 : Comparison, by median test, of the pre-test results of the four samples in Experiment Three (Ns 20, 16, 20, 13)

and the samples in Experiments One (N=18) and Two (N=18) and the Standard One Sample (N=35)

Note: (i) The tables below give Chi square and approximate probability values.

(ii) Yates's correction for continuity was applied in each case.

(iii) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

ENGLISH

	Std. One	Expt. One	Expt. Two	Expt. Three (Sample 1)	Expt. Three (Sample 2)	Expt. Three (Sample 3)
Expt. One	0.00 99%					
Expt. Two	0.00 99%	0.01 90%				
Expt. Three (Sample 1)	0.62 30-50%	3.16 5-10%	5.17 2-5%			
Expt. Three (Sample 2)	0.01 90%	2.95 5-10%	2.95 5-10%	0.00 98%		
Expt. Three (Sample 3)	9.41 < 1%	2.06 10-20%	5.57 1-2%	0.10 70-80%	0.11 70-80%	
Expt. Three (Sample 4)	2.21 10-20%	0.00 98%	0.80 30-50%	0.02 90%	0.83 30-50%	1.29 20-30%

ARITHMETIC

	Std. One	Expt. One	Expt. Two	Expt. Three (Sample 1)	Expt. Three (Sample 2)	Expt. Three (Sample 3)
Expt. One	1.34 20-30%					
Expt. Two	3.06 5-10%	1.01 30%				
Expt. Three (Sample 1)	9.40 < 1%	0.00 98%	12.77 < 1%			
Expt. Three (Sample 2)	7.07 < 1%	0.13 70-80%	9.56 < 1%	0.40 50-60%		
Expt. Three (Sample 3)	6.29 1-2%	0.45 50%	12.89 < 1%	0.00 99%	0.11 70-80%	
Expt. Three (Sample 4)	6.49 1-2%	0.03 90%	0.31 50-70%	0.00 99%	0.11 70-80%	0.09 70-80%

PROGRESSIVE MATRICES

	Std. One	Expt. One	Expt. Two	Expt. Three (Sample 1)	Expt. Three (Sample 2)	Expt. Three (Sample 3)
Expt. One	5.43 2%					
Expt. Two	0.00 99%	3.66 5-10%				
Expt. Three (Sample 1)	0.00 99%	5.17 2-5%	0.00 99%			
Expt. Three (Sample 2)	0.00 99%	2.95 5-10%	0.00 99%	0.13 70-80%		
Expt. Three (Sample 3)	0.00 99%	2.64 10-20%	0.07 80%	0.40 50-60%	0.11 70-80%	
Expt. Three (Sample 4)	0.00 99%	2.59 10-20%	0.17 70%	0.73 30-50%	0.03 80-90%	0.00 99%

(ii) Table 13 shows that only the following samples in the research project were matched on the Educational Attainment Grading tests in English and Arithmetic and on the Raven Progressive Matrices test:-

Experiment Three (Samples Two, Three and Four) and the sample in Experiment One.

Experiment Three (Sample Four) and the sample in Experiment Two.

The Standard One Sample and the sample in Experiment Two.

The Experiment One sample and the sample in Experiment Two.

All the samples in Experiment Three.

All the other samples were not matched in terms of English and Arithmetic attainment and non-verbal ability. Consequently, no further comparisons were possible with these samples.

(iii). The incremental gains achieved by the matched samples listed above were compared to determine whether the various methods of presentation had resulted in any significant differences in English and Arithmetic attainment, as measured by the Educational Attainment Grading tests. The results of this comparison are shown in Table 14 below.

Table 14 : Comparison of the incremental gains, by median test, made by the samples in Experiment Three, Experiment Two, Experiment One, and Standard One.

Note: (i) The tables below give Chi square and approximate probability values.

(ii) Yates's correction for continuity was applied in each case.

(iii) With 1 df, Chi square = 3.841 is required for significance at the 5% level of confidence.

ENGLISH

	Std. One	Expt. One	Expt. Two	Expt. Three (Sample 1)	Expt. Three (Sample 2)	Expt. Three (Sample 3)
Expt. One	not matched					
Expt. Two	0.62 30-50%	2.78 10%				
Expt. Three (Sample 1)	not matched	not matched	not matched			
Expt. Three (Sample 2)	not matched	2.95 5-10%	not matched	0.11 70-80%		
Expt. Three (Sample 3)	not matched	2.06 10-20%	not matched	0.00 99%	0.11 70-80%	
Expt. Three (Sample 4)	not matched	2.63 10-20%	6.80 < 1%	0.02 90%	0.86 30-50%	0.33 50-70%

ARITHMETIC

	Std. One	Expt. One	Expt. Two	Expt. Three (Sample 1)	Expt. Three (Sample 2)	Expt. Three (Sample 3)
Expt. One	not matched					
Expt. Two	0.00 99%	1.01 30%				
Expt. Three (Sample 1)	not matched	not matched	not matched			
Expt. Three (Sample 2)	not matched	0.00 99%	not matched	0.11 70-80%		
Expt. Three (Sample 3)	not matched	0.08 70-80%	not matched	0.10 70-80%	0.11 70-80%	
Expt. Three (Sample 4)	not matched	0.02 90%	0.80 30-50%	0.70 30-50%	0.01 90-95%	0.21 50-70%

(iv) These results indicate that except for the significant gain in English made by the sample in Experiment Two when compared with Sample Four in Experiment Three, there were no significant differences, at the 5% level of confidence, between the gains made by the samples in Experiment Three, Experiments One and Two and the sample in Standard One on both the English and Arithmetic Educational Attainment Grading tests.

(v) Although there were no significant differences between the gains made by most of the matched samples in the research project, the table below, showing t-test and probability values, gives some indication of the descending order of gain in English and Arithmetic attainment. This table must be interpreted with caution since not all the samples were matched. For example, the Standard One sample can be compared with the Experiment Two sample, but cannot be compared with any of the other samples as they were not matched with the Standard One Sample (see page 78).

Table 15 : Comparison of the t-test results for English and Arithmetic Attainment of the samples in Standard One, Experiment One, Experiment Two and Experiment Three.

	t ratio	df	Probability	Order of Gain
Standard One (N=35)				
English	4.65	68	less than 0.1%	2.5
Arithmetic	0.43	68	greater than 50%	7
Experiment One (N=18)				
English	2.19	34	2-5%	6.5
Arithmetic	1.93	34	5-10%	6
Experiment Two (N=18)				
English	4.85	34	less than 0.1%	2.5
Arithmetic	2.44	34	2%	4
Experiment Three				
Sample One (N=20)				
English	3.40	38	less than 0.2%	4
Arithmetic	5.04	38	less than 0.1%	1
Sample Two (N=16)				
English	3.17	30	less than 1%	5
Arithmetic	3.79	30	less than 0.1%	2
Sample Three (N=20)				
English	5.13	38	less than 0.1%	1
Arithmetic	3.62	38	less than 0.1%	3
Sample Four (N=13)				
English	2.14	24	2-5%	6.5
Arithmetic	2.39	24	2-5%	5

(vi) Conclusion

(a) English

From Table 15 it would appear that one of the most effective methods of teaching English resulted from a classroom teacher employing the methods and visual materials that had been perfected at the Television Centre. This emphasizes the importance of the type of training given to the classroom teacher rather than the medium of instruction. The table also indicates that teaching English by television alone, and particularly with the assistance of a classroom teacher, was at least as effective in terms of attainment, and probably more rapid, than teaching by conventional classroom methods.

(b) Arithmetic

It would appear that teaching Arithmetic through the medium of television with the assistance of a classroom teacher was the most effective method in terms of attainment. The table also indicates that teaching Arithmetic by television alone or by using only the television methods and materials, was at least as effective as teaching by conventional classroom methods.

It should be noted that the improved methods of television presentation in Experiments Two and Three resulted in greater attainment in both English and Arithmetic when compared with the attainment of the sample in Experiment One.

CHAPTER 3

CONCLUSIONS FROM THE EXPERIMENTS

The most important finding of the research was that it is possible for a teacher to use television as an educational aid in teaching simple English and Arithmetic to adults of limited education and that from the results provided by the three experiments adults appeared to learn at least as fast, if not faster, when taught through the medium of television as when they were taught in a conventional classroom situation.

However, it is difficult to decide just how successful this teaching was in comparison with the teaching at the Adult Education Centres at Rhokana because of the many unknown factors involved in the three experiments and in the classes at the Adult Education Centres. This difficulty is not one peculiar to this research. Bundy (1959), for example, in assessing the results of his findings in teaching Spanish verbs came to the conclusion that - "It is probably unrealistic to expect to find dramatic differences in any comparison of teaching methods or technique when academic achievement is the criterion" for "when knowledge is used as a criterion to discover the differential effects of two teaching methods, the results are disappointing."

One of the main reasons for this was the limited number of experimental subjects available. Consequently, to register any marked statistical differences in comparisons of the academic progress of the samples relatively large differences had to be registered between samples. The samples in this research ranged from 13 to 35 students only with the result that where differences in attainment between samples were found, they usually failed to reach significance at the generally accepted levels of confidence.

Another factor which must be considered when measuring the relative academic progress of samples is that "the measuring instruments may not have been truly appropriate to the specialised learning situation involved" (Bundy 1959). The Educational Attainment Grading tests constructed by J.H.F. Kemp for use at Rhokana Corporation were not geared to the content of the courses at either the Television Centre or the Adult Education Centres. Moreover, these tests have not been validated and there are no real grounds for maintaining that the tests provided accurate gradings of the levels of attainment of the students in the various samples. They are, in fact, tests which would give only a rough indication of the abilities of students in English and Arithmetic.

A further complication with the tests is that it has not been shown that the has for non-verbal ability (Raven's Progressive Matrices) have been validated for adults on the Copperbelt and that it does indicate the actual non-verbal ability of students.

It is obvious that although the samples appeared to be matched on certain abilities it would be difficult to claim that this was entirely true. Consequently, it would be difficult to claim that the results obtained are really significant. Care must be taken not to interpret these results as conclusive.

The treatment received by the various samples may appear to have been comparable, but here again there were several ways in which the treatment of the samples could vary.

First, it is impossible to assess the characteristics of a teacher so as to be able to compare his teaching with that of another. In the treatment of the various samples different teachers were used. They may have appeared to be equal as far as paper qualifications showed, but it cannot be claimed that all the teachers concerned were equal in teaching ability. In fact, the two television teachers had been chosen for their outstanding teaching ability relative to that of the other teachers at the Adult Education Centres. The samples in Experiments One and Two were taught by these two teachers both on television and in the classroom, so it could be claimed that the progress of these two samples, when compared with the progress of the sample in Standard One at the Adult Education Centres, was more the result of their teaching than the result of television.

A second factor which could have affected the rate of progress of certain samples was the Hawthorne effect. Great interest was shown by all the visitors to the Television Centre in the work of the students there. This interest certainly affected the rate of progress of these students. The same sort of conditions did not apply in the Adult Education Centres. It was impossible to remove this factor from Experiments One and Two. However, in Experiment Three, when few visitors watched the classes at work, the effects of this were partly removed. Nevertheless, the special treatment afforded to students at the Television Centre - a special bus for instance - still helped to differentiate those students at the Television Centre from the students at the Adult Education Centres and could have affected their rate of progress.

A third factor differentiating the treatment of the various samples was that classes took place at fixed times at the Television Centre and students were not required to change their time of attendance as they changed shifts. This changing of time often affected attendance at the Adult Education Centres and was considered by many teachers to be the main cause of students' drop-out.

A final factor differentiating the samples was that some of the students attended classes voluntarily and some attended compulsorily. Obviously those who attended as part of a compulsory training course, such as the Mechanics' Training Course, would be more strongly motivated to learn than those students who attended for more private reasons. The trainees could expect a possible financial return on their learning, whereas the voluntary adult students were not assured of any financial gain from attendance at the Adult Education Centres.

Considering all these factors, it would be difficult to claim that the result in any one experiment was the product of any one particular method or technique.

It would appear, for instance, from the results in Experiment Three, that when television is used, the effect of the classroom teacher on student attainment is relatively slight. However, not only the statistical results must be considered. Where there was a classroom teacher there was better classroom organisation than where there was no classroom teacher at all. Moreover, the drop-out of students in the class with the teacher was less than in the class where there was no teacher. But even without the classroom teacher, television teaching appeared to have the power to hold a class. The television classes had a far more satisfactory attendance record than the classes at the Adult Education Centres at Rhokana. A possible reason for this may have been the greater discipline imposed by the television teacher both on the material being taught and on the students. This was obvious when comparisons with the classes at the Adult Education Centres were made. The holding power of television teaching is a most important advantage as one of the great failures in many courses for adults such as are run by the copper mines is that the normal drop-out makes it almost impossible to run the courses efficiently.

But considering the results from even the most unfavourable point of view, the findings seem reasonably indicative that complex language form and arithmetical concepts can be communicated by specialised television presentational techniques as effectively as – and very probably more effectively than - by conventional classroom proceedings. One of the major reasons for this could be the facility of superimposition offered by television. This subject is dealt with more fully in Part One of this report.

What, then, are the implications of these findings in relation to education? The broader implications for administrators responsible for maintaining standards of language instruction to increasing enrolments is clear. When a superior teacher taught complex language and arithmetical concepts through specialised television techniques, students so exposed did fully as well as - and probably better than - their conventional classroom counterparts. If experimental classes could so learn, it is reasonable to suppose that a dozen or a hundred could have done likewise.

Hence, when the problem of increased enrolment can no longer be met by scheduling more sections to be taught by more teachers in more classrooms - or when such scheduling will result in lowered standards as the proportion of fully qualified teachers decreases - the alternative of teaching literacy through the medium of television may reasonably be expected to produce student achievement fully equivalent - and probably superior - to that produced by conventional classroom procedures.

Moreover, by implication from the broader interpretation of these findings, there is good reason to believe that improved comprehension of complex word form concepts can now be secured by effective utilization of television techniques. Hence, the use of television in the teaching of literacy - if the abilities of the medium are effectively utilized - is a desirable procedure, not merely an acceptable alternative, in time of future need.

There is also the strong probability that similar results can be expected in the teaching of other subjects through the exploitation of television techniques. However, further investigation is needed.

1. It is suggested that further studies on the replication or modification of the present studies should be undertaken.

2. Further research should be made into methods of presentation and into methods of utilizing television programmes in classrooms.

3. Finally, adequate testing instruments to test not only quantitatively but qualitatively the effects of instructional television programmes should be devised so that more accurate assessments of the results of television can be made.

BIBLIOGRAPHY

1. Allen, M.R. Television, Education and the Armed Forces: an Informal Report with Recommendations for Employment upon Mobilisation. Fort Lee, Virginia: Quartermaster Training Command, 1958.
2. Anastasi, A. Psychological Testing. New York: Macmillan, 1962.
3. Asheim, L. et al. Educational Television: The Next Ten Years: and a Summary of Major Studies on the Problems and Potential of Educational Television. Palo Alto: Institute for Communications Research, Stanford University, 1962.
4. Bundy, E.W., Farrell, G., and Albrecht, E.J. An Experimental Study of the Relative Effectiveness of Television Presentational Techniques and Conventional Classroom Procedures in Promoting Initial Comprehension of the Basic Verb Form Concepts in Elementary Spanish. Detroit: University of Detroit, 1959.
5. Cable, Ralph. Audio-Visual Handbook. London: London University Press, 1964.
6. Carpenter, C.R., and Greenhill, L.P. An Investigation of Closed Circuit Television for Teaching University Courses. Penn. State University, 1958.
7. Cassirer, H.R. Television Teaching Today. Paris: UNESCO 1960.
8. Centre for Educational Television Overseas. Report of the International Working Group on Educational Television. London: C. E. T. O., 1965.
9. Chapman, D. Inc. Design for Educational Television: Planning for Schools with Television. New York: Educational Facilities Laboratories, 1960.
10. Corder, S.P. English Language Teaching and Television. London: Longmans, 1960.
11. Council for Cultural Co-operation, Council of Europe. Modern Language Teaching by Television. Strasbourg: The Council, 1965.
12. Diamond, H.J.K. Instructional Television. New York: McGraw-Hill, 1964.
13. Dumazedier, J. Television and Rural Adult Education: The Tele-Clubs in France. Paris: UNESCO, 1956.

14. Ferguson, G.A. Statistical Analysis in Psychology and Education. New York: McGraw-Hill, 1959.

15. The Fund for the Advancement of Education. Teaching by Television., New York: Ford Foundation and the Fund, 1959.

16. Guilford, J.P. Fundamental Statistics in Psychology and Education. New York: McGraw-Hill, 1956.

17. Gurrey, P. Teaching English as a Foreign Language. London: Longmans, 1955.

18. Himmelweit, H.T., Oppenheim, A.N., and Vince, P. Television and the Child: An Enpirical Study of the Effects of Television on the Young. London: Oxford University Press, 1958.

19. Holmes, Presley D., Jr. Television Research in the Teaching-Learning Process. Detroit: Wayne State University, 1959.

20. Klopper, H.L. Closed-Circuit Television as a Medium of Instruction in New York State University. New York: New York University, 1958.

21. Kumata, Hideya. An Inventory of Instructional Television Research. Ann Arbor, Michigan: The Educational Television and Radio Centre, 1961.

22. Lee, W.R., and Coppen, Helen. Simple Audio-Visual Aids to Foreign-Language Teaching. London: Oxford University Press, 1964.

23. Louis, R., and Rovan, J. Television and Tele-Clubs in Rural Communities: an Experiment in France. Paris: UNESCO, 1955.

24. MacArthur, R.S., Irvine, S.H., and Brimble, A.R. The Northern Rhodesia Mental Ability Survey, 1963. Lusaka, N. Rhodesia: Rhodes-Livingstone Institue, 1964.

25. Mitchell, J.C. A Note on the Urbanisation of Africans on the Copperbelt. Rhodes-Livingstone Journal XII, 1951.

26. Mitchell, J.C. The Distribution of African Labour by Area of Origin in the Copper Mines of Northern Rhodesia. Rhodes-Livingstone Journal XIV, 1954.

27. Quirk, Randolph and Smith (Eds.). The Teaching of English. London: Oxford University Press, 1964.

28. Radio Televisione Italiana. Proceedings of the International Conference of Broadcasting Organisations on Sound and Television School Broadcasting. Rome, December, 1961.

29. Roan Antelope Copper Mine, Zambia. Information Course: Education. Luanshya: The Mine, November, 1960.

30. Schramm, W.L., Lyle, J., and Parker, E.B. Television in the Lives of our Children. Palo Alto: Stanford University Press, 1961.

31. Schramm, W.L., Lyle, J., and Pool, Ida Sola. The People Look at Educational Television. Palo Alto: Stanford University Press, 1963.

32. Schramm, W.L. (Ed.), The Impact of Educational Television. Urbana: University of Illinois Press, 1960.

33. Skinner, B.F. Verbal Behaviour. New York: Appleton, 1957.

34. Smith, Mary Howard (Ed.), Using Television in the Classrooms. New York: McGraw-Hill, 1961.

35. Townsend Coles, E.K. Educational Television in Central Africa. Salisbury: Institute of Adult Education, University College of Rhodesia and Nyasaland, 1962 (Unpublished).

APPENDIX A

SAMPLE IN STANDARD ONE AT RHOKANA CORPORATION'S ADULT EDUCATION CENTRES IN 1964

	TABLE A.1.	PRE-TEST RESULTS		TABLE A.2. POST-TEST RESULTS		TABLE A.3. INCREMENT	
	Progressive Matrices	English	Arithmetic	English	Arithmetic	English	Arithmetic
	17	13	11	32	24	+ 19	+ 13
	18	33	12	20	11	- 13	- 1
	12	23	15	31	20	+ 8	+ 5
	18	22	11	43	22	+ 21	+ 11
	9	15	41	22	11	+ 7	- 30
	4	8	11	26	25	+ 18	+ 14
	16	18	5	22	14	+ 4	+ 9
	10	22	13	35	27	+ 13	+ 14
	11	26	27	21	9	- 5	- 18
	8	21	6	27	17	+ 6	+ 11
	9	29	27	28	22	- 1	- 5
	8	17	19	23	26	+ 6	+ 7
	6	18	4	28	31	+ 10	+ 27
	12	29	31	23	3	- 6	- 28
	14	31	11	31	15	0	+ 4
	17	16	12	40	24	+ 24	+ 12
	16	15	27	20	5	+ 5	- 22
	13	18	30	31	7	+ 13	- 23
	18	12	9	23	13	+ 11	+ 4
	4	12	9	32	30	+ 20	+ 21
	16	1	26	43	15	+ 42	- 11
	17	9	10	28	10	+ 19	0
	11	4	6	30	12	+ 26	+ 6
	18	10	19	28	16	+ 18	- 3
	14	35	18	29	14	- 6	- 4
	9	17	12	23	20	+ 6	+ 8
	21	40	40	30	20	- 10	- 20
	23	17	31	27	11	+ 10	- 20
	10	27	12	41	26	+ 14	+ 14
	5	27	6	29	21	+ 2	+ 15
	6	19	23	18	11	- 1	- 12
	7	27	26	27	12	0	- 14
	12	17	19	30	14	+ 13	- 5
	0	22	19	23	15	+ 1	- 4
	2	21	19	23	13	+ 2	- 6
No. IN SAMPLE:	35	35	35	35	35	35	35
MEAN:	11.7	19.7	17.6	28.2	16.7	8.5	- 0.9
S.D.:	5.5	8.5	9.7	6.3	7.0	11.2	14.4

APPENDIX B

EXPERIMENT ONE

TABLE B.1. BIOGRAPHICAL DATA

	Age	Length of Service	Standard Claimed	Tribe
	32	3½	I	Senga
	39	10	I	Bemba
	41	10	V	Nyakyusa
	30	6	I	Senga
	52	9	II	Bemba
	38	7½	I	Chishinga
	40	6	O	Luano
	45	26	IV	Lala
	42	19	II	Mukulu
	39	15	II	Lala
	45	6	O	Senga
	52	17	II	Unga
	45	4	III	Senga
	33	8	I	Bemba
	49	7½	I	Lima
	26	7	III	Chishinga
	33	8	III	Lala
	34	5	II	Lala
NO. IN SAMPLE:	18	18	18	
MEAN:	39.7	9.7	I	
S.D.:	7.5	5.9	2	

TABLE B.2. PRE-TEST RESULTS

	Progressive Matrices	English	Arithmetic
	27	9	8
	20	2	5
	26	11	13
	21	1	3
	16	25	15
	18	10	2
	13	6	4
	14	24	12
	15	7	1
	2	18	6
	17	5	14
	15	13	3
	23	27	8
	21	36	15
	17	29	20
	34	32	20
	17	30	12
	28	36	10
MEAN:	19.1	17.8	9.5
S.D.:	6.9	11.7	5.8

APPENDIX B

EXPERIMENT ONE

TABLE B.3. POST-TEST RESULTS

	English	Arithmetic
	10	10
	8	6
	26	13
	20	8
	33	22
	15	2
	24	6
	28	18
	28	11
	23	11
	18	14
	24	6
	26	17
	40	22
	33	25
	34	21
	33	18
	37	14
MEAN:	25.5	13.6
S.D::	8.7	6.4

TABLE B.4. INCREMENT

	English	Arithmetic
	+ 1	+ 2
	+ 6	+ 1
	+ 15	0
	+ 19	+ 5
	+ 8	+ 7
	+ 5	0
	+ 18	+ 2
	+ 4	+ 6
	+ 21	+ 10
	+ 5	+ 5
	+ 13	0
	+ 11	+ 3
	- 1	+ 9
	+ 4	+ 7
	+ 4	+ 5
	+ 2	+ 1
	+ 3	+ 6
	+ 1	+ 4
MEAN:	7.7	4.1
S.D.:	6.6	3.0

APPENDIX C

EXPERIMENT TWO

TABLE C.1. BIOGRAPHICAL DATA

	Age	Length of Service	Standard Claimed	Tribe
	35	13	O	Nyiha
	29	5	I	Nsenga
	29	1	III	Safwa
	36	6	II	Kaonde
	29	1	II	Safwa
	32	3	I	Nyakyusa
	32	3	II	Nyanja
	32	8	II	Bemba
	24	1	I	Kinga
	34	9	II	Kaonde
	35	14	II	Kinga
	31	3	I	Chewa
	29	3	I	Lozi
	35	6	II	Lemba
	23	1	II	Tumbuka
	53	23	O	Bemba
	25	1	O	Lala
	24	4	II	Bemba
NO. IN SAMPLE:	18	18	18	
MEAN:	31.5	5.8	I	
S.D.:	6.3	5.9	1	

TABLE C.2. PRE-TEST RESULTS

	Progressive Matrices	English	Arithmetic
	16	7	13
	8	24	14
	17	14	5
	12	10	13
	9	15	14
	8	14	15
	5	17	13
	3	27	13
	18	18	13
	16	31	14
	6	28	12
	16	26	4
	4	19	12
	13	21	12
	19	17	12
	11	13	11
	6	35	12
	12	36	13
MEAN:	11.1	20.7	11.9
S.D.:	5.0	8.2	2.8

APPENDIX C

EXPERIMENT TWO

TABLE C.3. POST-TEST RESULTS

	English	Arithmetic
	26	12
	35	9
	17	7
	31	10
	38	17
	34	20
	22	13
	40	14
	30	15
	38	14
	35	15
	36	14
	33	16
	31	13
	33	14
	29	24
	41	29
	44	23
MEAN:	32.9	15.5
S.D.:	6.5	5.3

TABLE C.4. INCREMENT

	English	Arithmetic
	+ 19	- 1
	+ 11	- 5
	+ 3	+ 2
	+ 21	- 3
	+ 23	+ 3
	+ 20	+ 5
	+ 5	0
	+ 13	+ 1
	+ 12	+ 2
	+ 7	0
	+ 7	+ 3
	+ 10	+ 10
	+ 14	+ 4
	+ 10	+ 1
	+ 16	+ 2
	+ 16	+ 13
	+ 6	+ 17
	+ 8	+ 10
MEAN:	12.2	3.6
S.D.:	5.7	5.5

APPENDIX D

BIOGRAPHICAL DATA OF THE SAMPLES IN EXPERIMENT THREE

TABLE D.1. SAMPLE ONE

	Age	Length of Service	Standard Claimed	Tribe
	35	13	II	Nyiha
	32	5	III	Nsenga
	21	1	I	Safwa
	23	5	I	Bemba
	34	2	II	Tonga
	32	6	III	Kaonde
	39	1	II	Safwa
	29	3	I	Nyakyusa
	38	3	O	Nyanja
	29	4	I	Bemba
	28	1	I	Chishinga
	23	9	V	Kaonde
	27	14	I	Chishinga
	27	3	II	Chewa
	36	3	I	Lozi
	33	6	O	Lemba
	27	1	IV	Tumbuka
	37	9	II	Chewa
	19	2	II	Lemba
	17	1	O	Lala
NO. IN SAMPLE:	20	20	20	
MEAN:	29.3	4.6	I	
S.D.:	6.2	3.8	2	

TABLE D.2. SAMPLE TWO

	Age	Length of Service	Standard Claimed	Tribe
	29	0	III	Bemba
	28	5	O	Lozi
	35	3	II	Kusa
	18	4	I	Bemba
	47	3	O	Ndali
	47	18	O	Mukulu
	34	10	I	Tonga
	19	1	IV	Safwa
	29	6	III	Kusa
	34	6	I	Ndali
	29	9	O	Safwa
	39	18	II	Chishinga
	27	14	O	Bemba
	27	12	IV	Tumbuka
	43	2	I	Safwa
	28	9	II	Nyakyusa
NO. IN SAMPLE:	16	16	16	
MEAN:	32.1	7.5	I	
S.D.:	8.3	5.5	2	

APPENDIX D

BIOGRAPHICAL DATA OF THE SAMPLES IN EXPERIMENT THREE

TABLE D.3. SAMPLE THREE

	Age	Length of Service	Standard Claimed	Tribe
	36	4	I	Bemba
	43	12	II	Nyakyusa
	39	6	I	Lunda
	47	12	II	Senga
	32	6	I	Bisa
	45	8	II	Bemba
	45	2	II	Safwa
	46	26	II	Ushi
	42	4	II	Bemba
	40	9	I	Nyakyusa
	44	2	O	Namwanga
	37	4	O	Chewa
	33	1	III	Tumbuka
	43	5	II	Bemba
	29	4	II	Nyakyusa
	32	16	II	Ngonde
	27	11	II	Matengo
	44	5	III	Namwanga
	34	3	I	Safwa
	34	5	I	Bemba
NO. IN SAMPLE:	20	20	20	
MEAN:	38.6	7.3	I	
S.D.:	6.0	5.8	1	

TABLE D.4. SAMPLE FOUR

	Age	Length of Service	Standard Claimed	Tribe
	18	1	II	Tabwa
	34	3	I	Kabende
	29	6	II	Ngonde
	25	12	III	Kabende
	28	10	O	Bisa
	36	15	II	Bemba
	38	5	I	Swaka
	32	3	IV	Lima
	34	12	II	Lomwe
	33	5	II	Lima
	24	6	II	Bisa
	44	1	III	Kaonde
	34	11	O	Bisa
NO. IN SAMPLE:	13	13	13	
MEAN:	31.5	6.9	I	
S.D.:	6.4	4.4	2	

APPENDIX D

PRE-TEST RESULTS OF THE SAMPLES IN EXPERIMENT THREE

TABLE D.5. SAMPLE ONE

	Progressive Matrices	English	Arithmetic
	9	5	7
	4	2	5
	15	12	8
	31	15	7
	19	9	8
	6	0	11
	11	7	10
	13	7	3
	18	4	4
	2	18	4
	15	1	1
	11	20	5
	7	10	5
	7	24	6
	12	8	3
	6	19	2
	20	24	18
	0	12	9
	13	1	17
	1	13	13
MEAN:	11.0	10.6	7.3
S.D.:	7.3	7.4	4.5

TABLE D.6. SAMPLE TWO

	Progressive Matrices	English	Arithmetic
	6	8	16
	8	3	7
	11	3	5
	20	26	8
	16	8	7
	2	9	8
	20	10	11
	8	25	10
	17	23	9
	8	3	3
	3	6	4
	3	4	4
	1	2	3
	18	22	19
	17	21	11
	16	17	15
MEAN:	10.9	11.9	8.8
S.D.:	6.6	8.6	4.6

APPENDIX D

PRE-TEST RESULTS OF THE SAMPLES IN EXPERIMENT THREE

TABLE D.7. **SAMPLE THREE**

	Progressive Matrices	English	Arithmetic
	12	21	17
	17	6	7
	14	9	5
	12	15	8
	11	8	7
	17	7	8
	17	10	8
	15	19	10
	13	16	9
	16	14	19
	10	5	4
	11	2	4
	20	10	21
	13	8	3
	8	10	5
	7	9	5
	17	5	6
	7	21	3
	8	10	3
	16	14	18
MEAN:	13.1	11.0	8.5
S.D.:	3.7	5.2	5.5

TABLE D.8. **SAMPLE FOUR**

	Progressive Matrices	English	Arithmetic
	33	17	16
	2	2	7
	4	2	5
	14	25	8
	12	18	7
	16	10	8
	21	19	9
	13	22	9
	20	17	3
	18	16	5
	8	9	6
	14	11	18
	1	3	4
MEAN:	13.5	13.2	8.1
S.D.:	8.4	7.3	4.2

APPENDIX D

POST-TEST RESULTS OF THE SAMPLES IN EXPERIMENT THREE

TABLE D.9. **SAMPLE ONE**

	English	Arithmetic
	24	19
	5	10
	25	19
	25	23
	12	14
	6	18
	14	13
	12	8
	14	10
	27	14
	20	20
	36	27
	17	11
	24	13
	13	2
	13	30
	30	28
	18	17
	23	21
	20	21
MEAN:	18.9	16.9
S.D.:	7.8	7.0

TABLE D.10. **SAMPLE TWO**

	English	Arithmetic
	20	25
	20	9
	27	20
	23	10
	17	11
	12	9
	14	13
	28	18
	28	24
	35	26
	10	8
	14	21
	20	9
	25	35
	18	20
	20	23
MEAN:	20.7	17.6
S.D.:	6.5	7.7

APPENDIX D

POST-TEST RESULTS OF THE SAMPLES IN EXPERIMENT THREE

TABLE D.11. SAMPLE THREE

	English	Arithmetic
	27	27
	23	14
	25	14
	18	10
	11	15
	16	11
	17	16
	26	19
	24	10
	18	12
	26	4
	18	14
	23	20
	15	12
	11	17
	13	17
	16	14
	30	17
	16	10
	25	17
MEAN:	19.9	14.5
S.D.:	5.5	4.6

TABLE D.12. SAMPLE FOUR

	English	Arithmetic
	33	23
	14	14
	17	12
	27	10
	7	8
	10	8
	19	10
	23	24
	21	3
	23	18
	22	13
	30	35
	10	10
MEAN:	19.7	14.5
S.D.:	7.6	8.2

APPENDIX D

EXPERIMENT THREE : INCREMENT

TABLE D.13. SAMPLE ONE

	English	Arithmetic
	+ 19	+ 12
	+ 3	+ 5
	+ 13	+ 11
	+ 10	+ 16
	+ 3	+ 6
	+ 6	+ 7
	+ 7	+ 3
	+ 5	+ 5
	+ 10	+ 6
	+ 9	+ 10
	+ 19	+ 19
	+ 16	+ 22
	+ 7	+ 6
	0	+ 7
	+ 5	- 1
	- 6	+ 28
	+ 6	+ 10
	+ 6	+ 8
	+ 22	+ 4
	+ 7	+ 8
MEAN:	8.3	9.6
S.D.:	6.6	6.8

TABLE D.14. SAMPLE TWO

	English	Arithmetic
	+ 12	+ 9
	+ 17	+ 2
	+ 24	+ 15
	- 3	+ 2
	+ 9	+ 4
	+ 3	+ 1
	+ 4	+ 2
	+ 3	+ 8
	+ 5	+ 15
	+ 32	+ 23
	+ 4	+ 4
	+ 10	+ 17
	+ 18	+ 6
	+ 3	+ 16
	- 3	+ 9
	+ 3	+ 8
MEAN:	8.8	8.8
S.D.:	9.4	6.4

APPENDIX D

EXPERIMENT THREE : INCREMENT

TABLE D.15. SAMPLE THREE

	English	Arithmetic
	+ 6	+ 10
	+ 17	+ 7
	+ 16	+ 9
	+ 3	+ 2
	+ 3	+ 8
	+ 9	+ 3
	+ 7	+ 8
	+ 7	+ 9
	+ 8	+ 1
	+ 4	- 7
	+ 21	0
	+ 16	+ 10
	+ 13	+ 1
	+ 7	+ 9
	+ 1	+ 12
	+ 4	+ 12
	+ 11	+ 8
	+ 3	+ 14
	+ 6	+ 7
	+ 11	- 1
MEAN:	8.9	6.0
S.D.:	5.2	5.2

TABLE D.16. SAMPLE FOUR

	English	Arithmetic
	+ 16	+ 7
	+ 12	+ 7
	+ 15	+ 7
	+ 2	+ 2
	- 11	+ 1
	0	0
	0	+ 1
	+ 1	+ 15
	+ 4	0
	+ 7	+ 13
	+ 13	+ 7
	+ 19	+ 17
	+ 7	+ 6
MEAN:	6.5	6.4
S.D.:	8.0	5.5

APPENDIX E

A COMPARISON OF THE CONTENTS OF ENGLISH LESSONS PRESENTED IN THE THREE EXPERIMENTS

The figures in the three columns represent the lessons in New Ship English Book 1.

	Experiment One	Experiment Two	Experiment Three
Lesson 1	1	1	1
Lesson 2	2	2	2
Lesson 3	3	3	3
Lesson 4	4 - 5	4 - 5	4 - 5
Lesson 5	6 - 7	6 - 7	6 - 7
Lesson 6	6 - 7	8	8
Lesson 7	8	9	9
Lesson 8	9	10 - 11	10 - 11
Lesson 9	10 - 11	10 - 11	10 - 11
Lesson 10	10 - 11	12	12
Lesson 11	12	13	13
Lesson 12	13	14	14
Lesson 13	14	15 - 16	15 - 16
Lesson 14	15 - 16	17	17
Lesson 15	15 - 16	18	18
Lesson 16	17	19	18
Lesson 17	18	20	20
Lesson 18	19	20	20
Lesson 19	20	21	21
Lesson 20	20	22	22
Lesson 21	21	23	23
Lesson 22	22	24 - 25	24 - 25
Lesson 23	23	24 - 25	24 - 25
Lesson 24	24 - 25	26	26
Lesson 25	24 - 25	27	27
Lesson 26	26	28	28
Lesson 27	27	29	29
Lesson 28	28	30	30
Lesson 29	29	30	30
Lesson 30	30	31	31
Lesson 31	30	32	32
Lesson 32	31	33	33
Lesson 33	32	34	34
Lesson 34	33	35	35

continued/.....

APPENDIX E (Continued)

	Experiment One	Experiment Two	Experiment Three
Lesson 35	34	36	36
Lesson 36	35	37	37
Lesson 37	36	38	38
Lesson 38	37	39	39
Lesson 39	38	40	40
Lesson 40	39	41	41
Lesson 41	40	42	42
Lesson 42	41	43	43
Lesson 43	42	44	44
Lesson 44	43	45	45
Lesson 45	44	46	46
Lesson 46	45	47	47
Lesson 47	46	48 - 49	48 - 49
Lesson 48	47	50	50
Lesson 49	48	51	51
Lesson 50	49	52	52
Lesson 51		53	

APPENDIX E

A COMPARISON OF THE CONTENTS OF ARITHMETIC LESSONS PRESENTED IN THE THREE EXPERIMENTS

The figures in the three columns represent the pages in My Second Number Book and Zambia Arithmetic Book 1.

In Experiment One My Second Number Book was completed in 30 lessons.

In Experiment Two My Second Number Book was completed in 34 lessons.

In Experiment Three My Second Number Book was completed in 21 lessons.

On completion of My Second Number Book all samples went on to Zambia Arithmetic Book 1.

	Experiment One	Experiment Two	Experiment Three
Lesson 1	1	1	1
Lesson 2	2	2	2
Lesson 3	3	3	3 - 4
Lesson 4	4	4	5
Lesson 5	5	5	6 - 7
Lesson 6	6 - 7	6 - 7	8 - 9
Lesson 7	8	8	10 - 11
Lesson 8	9	9	12 - 13
Lesson 9	10	10 - 11	14 - 15
Lesson 10	11	12 - 13	16 - 17
Lesson 11	12	14	18 - 19
Lesson 12	13	15	20 - 21
Lesson 13	14	16 - 17	22
Lesson 14	15	18 - 19	23 - 24
Lesson 15	16	20	25 - 27
Lesson 16	17	21	28 & 31
Lesson 17	18 - 19	22	29, 30 & 32
Lesson 18	20	23	33, 36 & 37
Lesson 19	21	24	38 - 39
Lesson 20	22	25 - 26	40 - 42
Lesson 21	23	27 - 28	43 - 46
Lesson 22	24	29 - 30	1 - 2
Lesson 23	25 - 26	31	3 - 4
Lesson 24	27 - 28	32	5

continued/.....

APPENDIX E (Continued)

	Experiment One	Experiment Two	Experiment Three
Lesson 25	29 - 30	33	6 - 7
Lesson 26	31	34 - 35	8 - 9
Lesson 27	32	36	10 - 11
Lesson 28	33	37	12 - 13
Lesson 29	34	38 - 39	14
Lesson 30	35	40	15 - 16
Lesson 31	36	41 - 42	17 - 18
Lesson 32	37	43	19 & Revision
Lesson 33	38 - 39	44 - 45	20 - 21
Lesson 34	40	46	22 - 23
Lesson 35	41 - 42	1	24 - 25
Lesson 36	43	2	26 & 28
Lesson 37	44 - 45	3	27
Lesson 38	46	4	29 - 30
Lesson 39	1	5	31 - 32
Lesson 40	2	6	33 - 34
Lesson 41	3	7	35 - 36
Lesson 42	4	8	37 - 38
Lesson 43	5	9	39 - 40
Lesson 44	6	10	41
Lesson 45	7	11	42 - 43
Lesson 46	8	12	44
Lesson 47	9	13	45 - 46
Lesson 48	10	14	47 - 48
Lesson 49	11	15	49
Lesson 50	12	16	50
Lesson 51		17	

APPENDIX F

COMPARISON OF THE DURATION OF ENGLISH AND ARITHMETIC BROADCASTS IN THE THREE EXPERIMENTS

	ENGLISH (Minutes)			ARITHMETIC (Minutes)		
	Expt. One	Expt. Two	Expt. Three	Expt. One	Expt. Two	Expt. Three
Lesson 1	16	14	15	12	22	27
Lesson 2	21	12	14	18	13	21
Lesson 3	17	16	17	21	16	22
Lesson 4	16	19	23	18	15	23
Lesson 5	21	28	35	15	14	22
Lesson 6	7	18	18	18	-	22
Lesson 7	17	24	21	14	18	18
Lesson 8	17	13	20	11	19	23
Lesson 9	8	14	17	20	30	19
Lesson 10	21	18	15	15	21	19
Lesson 11	11	26	30	15	30	22
Lesson 12	23	23	31	20	25	20
Lesson 13	15	20	18	18	26	18
Lesson 14	11	15	16	30	15	16
Lesson 15	18	15	14	10	21	14
Lesson 16	13	15	18	15	24	13
Lesson 17	12	17	17	23	18	25
Lesson 18	17	16	21	10	9	21
Lesson 19	27	16	13	22	19	13
Lesson 20	22	12	20	23	20	12
Lesson 21	21	18	20	12	15	21
Lesson 22	16	15	15	18	19	20
Lesson 23	23	13	20	17	16	22
Lesson 24	31	20	18	14	11	18
Lesson 25	22	20	20	22	30	19
Lesson 26	22	17	20	22	30	19
Lesson 27	22	16	23	12	18	19
Lesson 28	22	26	15	18	15	20
Lesson 29	28	12	11	22	16	17
Lesson 30	21	15	22	22	22	18
Lesson 31	21	11	25	23	18	12
Lesson 32	22	21	20	17	20	21
Lesson 33	38	15	11	24	17	12
Lesson 34	28	18	17	17	13	18

continued/.....

APPENDIX F (Continued)

	ENGLISH (Minutes)			ARITHMETIC (Minutes)		
	Expt. One	Expt. Two	Expt. Three	Expt. One	Expt. Two	Expt. Three
Lesson 35	23	15	24	28	8	12
Lesson 36	22	19	18	24	22	14
Lesson 37	16	19	20	17	25	18
Lesson 38	21	15	18	6	22	17
Lesson 39	25	18	15	25	26	13
Lesson 40	25	20	21	28	18	17
Lesson 41	23	13	16	20	25	18
Lesson 42	24	19	15	24	26	12
Lesson 43	16	15	8	17	14	16
Lesson 44	15	12	29	21	10	15
Lesson 45	24	13	14	17	17	16
Lesson 46	20	25	21	16	15	13
Lesson 47	15	17	16	14	13	19
Lesson 48	35	21	11	22	12	12
Lesson 49	8	15	17	15	16	17
Lesson 50	21	12	11	24	10	23
Lesson 51	-	11	19	15	10	18
TOTAL IN HOURS AND MINUTES:	18/58	18/44	18/5	19/35	17/42	18/5
AVERAGE IN MINUTES:	19	17	18	18	16	18
NUMBER OF LESSONS:	50	51	50	50	51	50

APPENDIX G

CAPITAL EXPENDITURE ON EQUIPMENT

a) VIDEO EQUIPMENT

In Studio

2 Mobile Camera Chains comprising
2 – H.Q. Camera Heads
2 – Zoom Lenses
2 – 6½ Monitors
2 – Sets of Fixings
2 – Tripods
2 – Dollies
2 – Lengths of Camera Cable
2 – Vidicon Tubes
1 – Condensor Microphone
3 – Dynamic Microphones
2 – Table Stands
2 – Floor Stands
1 Fixed Camera Chain Comprising
1 – Camera Head
1 – Lens
1 – Camera Cable
1 – Reading Device
1 – Stand for above
1 – Vidicon Tube EL 5744/01
1 – 19'' Monitor

In Classrooms

3 – 23'' Monitors

In Control Room

3 – Camera control units
4 – Monitors 14''
1 – Video Mixer with intercom
4 – Telemic. Headsets
1 – 6 Channel Mixing Consolette
1 – Twin Sync. pulse generator
1 – Waveform monitor
1 – Operating desk for all above equipment
4 – Mounting trays for CCUs

Accessories

1 - Main Station intercom
2 - Slave Stations ”
4 - Loudspeakers
4 - Microphone extension cables
1 - 19” Monitor
Coaxial cables)
Control cables)
Installation material
Spare tubes and Components TOTAL: **£8,455.15. 0.**

b) SOUND EQUIPMENT

1 - Stereo Tape Recorder
1 - Six-channel mixing consolette
1 - Condenser Microphone
3 - Microphones
2 - Table stands
2 - Floor stands
1 - Record turntable TOTAL: **£500. 0. 0.**

c) LIGHTING

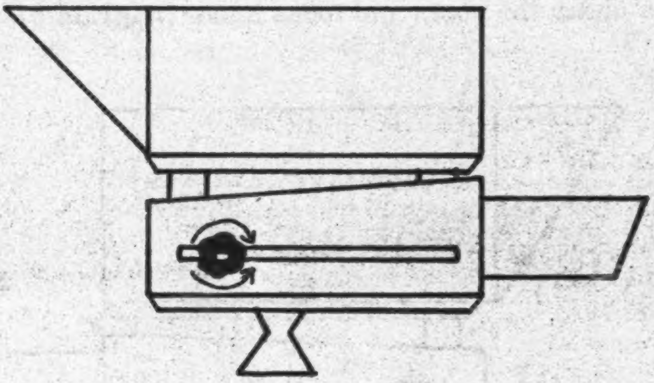
2 - 1 kw. Spot Lamps
2 - Scoops, with wire guards
3 - 500W Fresnel Spots
1 - Stand for 500W Pup TOTAL: **£149. 0. 0.**

d) INSTALLATION TOTAL: **£800. 0. 0.**

GRAND TOTAL: £9,904.15. 0.

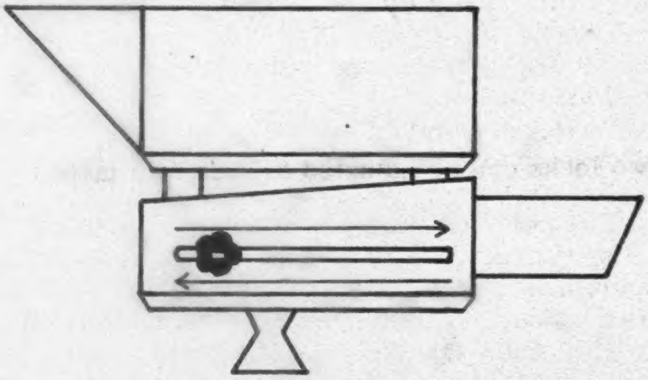
In the previous diagram, the shaded-in area is the monitor and below the monitor can be seen the adjustment knobs.

Focus - To focus is to make your picture become clear and sharp. To do this the big black knob at the right hand side of the camera is turned until your focus is correct (Diagram 3).



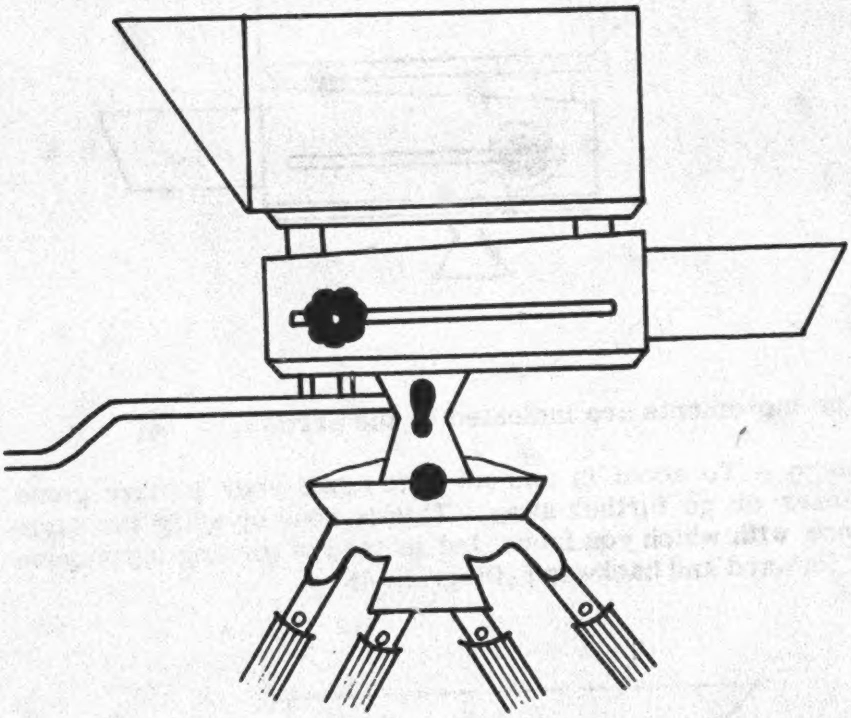
The movements are indicated by the arrows.

Zoom - To zoom in and out is to make your picture come closer or go further away. This is done by using the same knob with which you focus, but instead of turning it you push it forward and backward (Diagram 4).



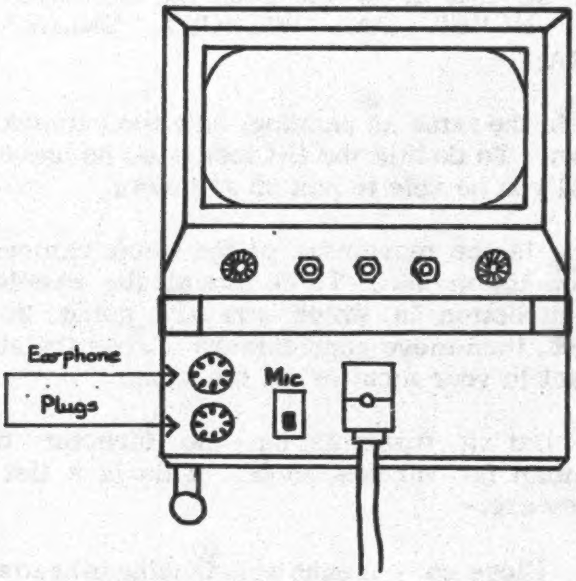
The motion for zooming is indicated by arrows.

Locking - This is to tighten your camera so that it will not fall over when left on its own. There are two locks on the camera. One is for the tilt, meaning up and down movement, and the other for pan, meaning side to side movement. The two locks are both situated on the right hand side of the camera under the zoom and focus knob.(Diagram 5).



These two locks can be adjusted to your own taste.

Cans or earphones - These are used to enable you to be in contact with the director at all times. They plug into a socket at the back of the camera beneath the monitor. Beside the socket is a switch which enables you to talk back to the director (Diagram 6).



Instructions for before and after use of the camera.

Before using the camera make sure that:-

(i) Your cable is unwound and not tangled.
(ii) Your cable is connected properly.
(iii) Your monitor is set and focus is good.
(iv) Your cans are in order and you are able to speak to the director.
(v) Your zoom and focus work properly.
(vi) All wheels and stands are in order.

IF ANYTHING IS WRONG WITH ANY PART OF YOUR CAMERA REPORT IT IMMEDIATELY.

After using the camera make sure that:-

(i) It is locked tight so that it will not fall over.
(ii) Your cable is wound up neatly and put away.
(iii) Your cans are unplugged and put away.
(iv) Your dust covers are placed over the cameras.

Use of the Camera.

The pan handle is used for holding on to the camera and for panning and tilting, which I will now explain:-

Panning means moving the camera from left to right or from right to left very slowly. To do this you must unlock your camera so that it is loose on the head and can be easily moved. NEVER PAN WITHOUT UNLOCKING YOUR CAMERA.

Tilting is the same as panning, only the camera is moved up and down. To do this the tilt lock must be unlocked and then only will you be able to pan up and down.

Tracking is the movement of the whole camera across the studio on its wheels. To do this all the wheels must point in the direction in which you are going, this is to avoid jerkiness, then move your camera across the studio keeping the object in your monitor all the time.

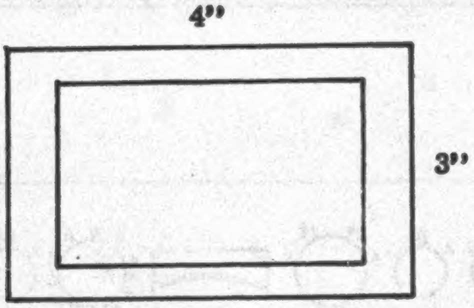
Shots - During transmission the director will ask the cameraman for various shots. This is a list of shots and what they are:-

- (i) Close up - means a shot taking in head and shoulders only.
- (ii) Extreme close-up - means a shot of very close to the face, taking only the head.
- (iii) Breast shot - means a shot taking in only the chest, shoulders and head.
- (iv) Medium shot - means a shot taking in only from the waist up, taking in arms, chest, shoulders and head.
- (v) Long shot - means a shot taking in the whole person or object.
- (vi) Wide shot - means a shot taking in everything possible without overshooting the curtains.

CARDS

In all television the card ratio is 4:3. That means in making cards for captions they must always be in the ratio of 4:3.

Example



All cards must have a safety margin of at least 1 inch. Here is a list of card sizes to be used depending on what is to be put on them.

3" × 4"
6" × 8"
9" × 12"

The last one is most certainly the largest to be used. ALL CARDS MUST HAVE A SAFETY MARGIN OF AT LEAST ONE INCH.

APPENDIX J

THE AUDIO OPERATION MANUAL

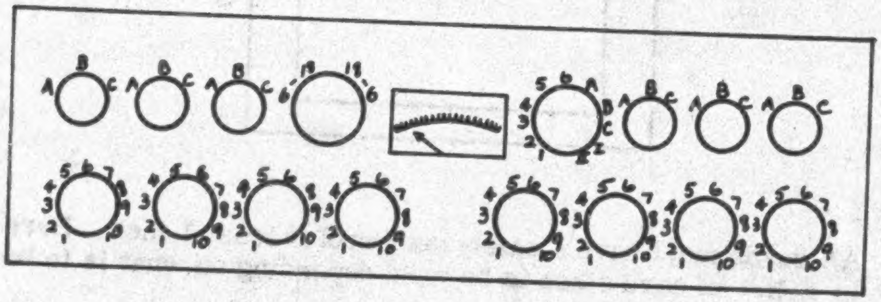

A
B
C
6
11
1
2
3
4
5
6
7
8
9
10

Diagram I

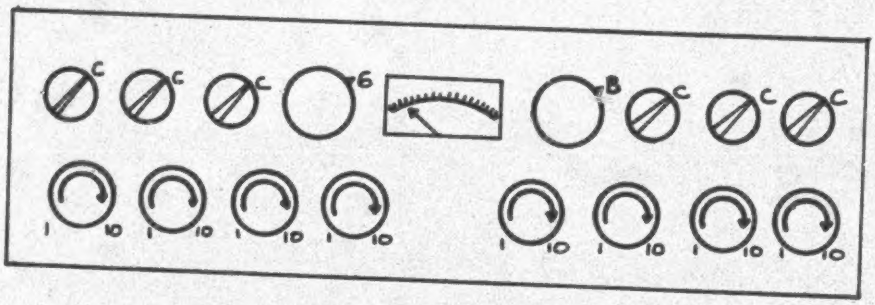


Diagram II

The sound desk consists of six controls for six microphones. These are numbered 1 to 6. There are two master controls which control the amount of sound going out and there is a V.U. meter which shows you how much sound goes out. Above the microphone controls are another set of controls. These are:- 1 - 2 - 3: they are channel controls for microphones and they are marked A B C. Then there is a control which sets Master I and Master II. The next one is a setting for your monitors which can control one monitor at a time. The next and last three controls on the top are the same as 1 - 2 - 3 but they control the channels for 4 - 5 - 6. At the back of the sound desk are eight plugs which are numbered 1 to 8 and these correspond to the controls on the front marked one to eight. These are the microphone plugs into which microphones are led from the studio and plugged in.

Use of controls

Along the top row the first three controls are sound channels. On the controls is a red arrow and there are three markings, A, B, C. The red arrow must always be in the "C" position before transmission. This also applies to the last three controls along the top line.

The next control after the first three is the master controller which should always be left on number two and six.

The next control is for the monitor speakers and this control should never be altered as it is set at the marking "B".

Along the bottom row 1 - 2 - 3 - 4 - 5 - 6 are microphone controls. Once the microphones are plugged in they can be controlled by these controls depending on what number the mike was plugged into.

The other two controls on the bottom row are the two master controls. After you have set your microphones on their controls they can be left and controlled by Master I which controls all the microphone channels. Master II should be turned up to point ten so that a V.U. reading can be obtained. During transmission the needle on the V.U. meter should never go over into the red.

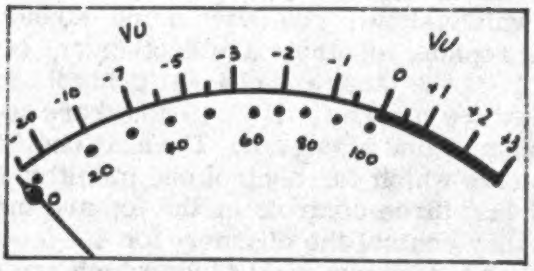


Diagram III

Instructions for use before transmission

1. Always make sure that all the controls are set up as in diagram II.
2. Set up microphones in the studio and check them. To check them make sure, first of all, that the lead is plugged into the socket or plug that you want it to be. Have someone talking into the microphone and then go into the control room and turn up the control corresponding to the number of the plug you have used.
3. Always make sure that the level of the sound never goes over into the red on the V.U. meter.

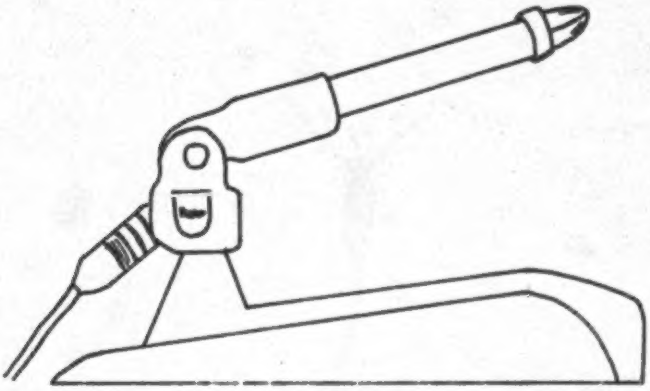
IF ANYTHING WHATSOEVER IS WRONG, REPORT IT IMMEDIATELY.

Instructions after use

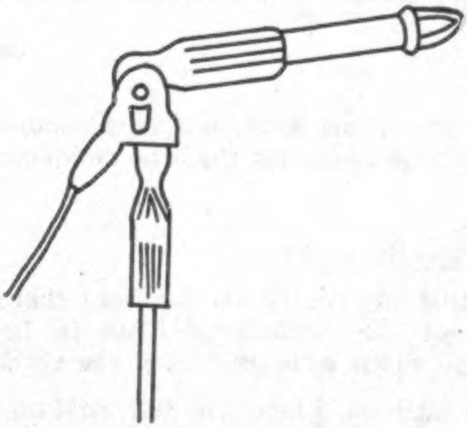
1. Turn all knobs being used, off.
2. Unscrew all microphones in the studio and handle them very carefully and then place them in the boxes. Then wind up all microphone cables and pack them away neatly after unplugging them.
3. Switch off the sound desk using the plug on the wall.
4. Replace cover on the sound desk.

Microphones

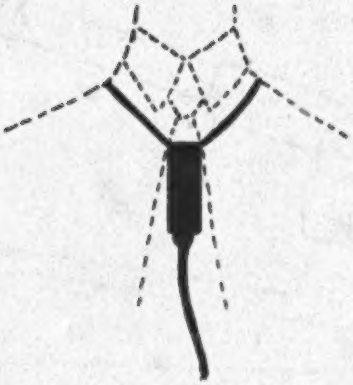
Three of the four microphones we use are on stands. The small stands are for table or desk use.



These can also be placed on the long stands for use when a person is standing.



The fourth microphone is a small one which can be used on a long stand or it can be hung around the neck to enable the person using it to move around.



ALL THESE MICROPHONES MUST BE HANDLED VERY GENTLY AS THEY ARE VERY FRAGILE AND CAN BE EASILY BROKEN. IF ANYTHING GOES WRONG WITH ONE DO NOT TAMPER WITH IT, BRING IT STRAIGHT TO THE MAN IN CHARGE.

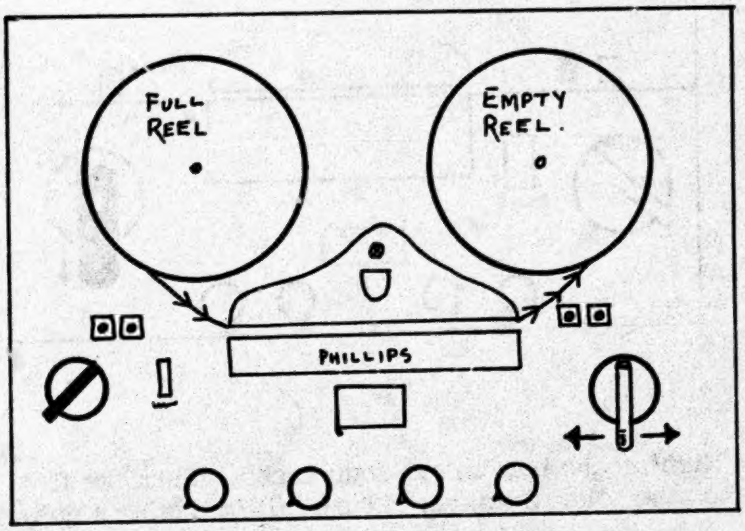
Tape Recorder

Attached to the sound desk is a tape recorder. During transmission this tape recorder must be recording all that goes on.

The use of the Tape Recorder

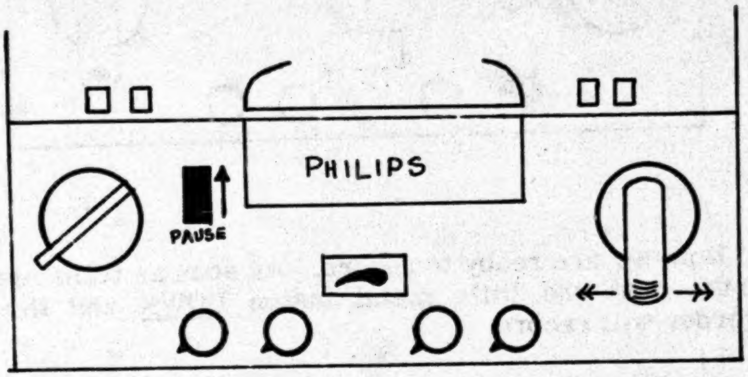
The tape must always be on the reel that goes on the left hand side of the recorder. This is because when recording the tape winds on to the reel on the right hand side.

To put the tape on, place the full reel on the left and take the tape through the slit in the centre of the recorder. Then thread it through the empty reel on the right. Turn the right hand side reel until there are approximately six turns on the reel and then it is ready.


FULL REEL
EMPTY REEL.
PHILLIPS

To record:

Under the left hand side reel there is a small metal button with the word **PAUSE** written under it. Push this button UP.


PHILIPS
PAUSE

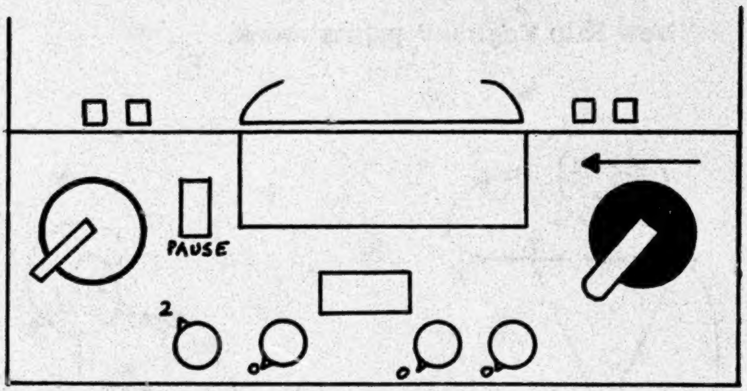
Next to the little metal button is a red button. This red button and the big metal lever, situated on the right side under the right hand side reel, must be pushed down together.

M

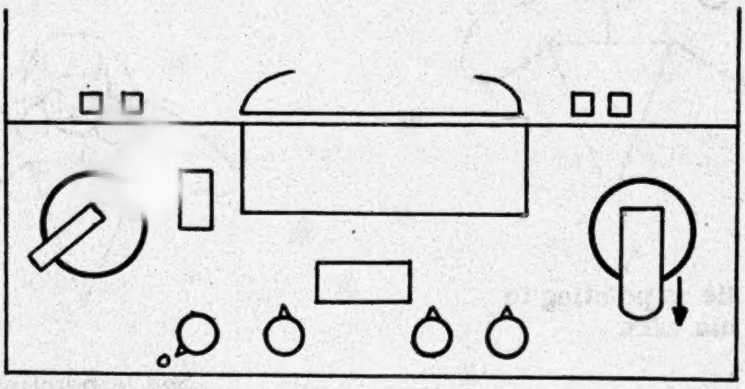
To stop the tape recorder, the large metal lever must be pushed down and then released.

To play back the recordings:

To do this the reel must be rewound. To rewind the tape you turn the white button under the metal lever in the left hand direction and the tape will rewind itself.



Let the tape run on and as soon as the right hand side reel is empty turn the white knob back to its normal position. Lace the tape back on to the right hand side reel and turn the reel a few times. Then turn down the first knob at the bottom of the recorder to O position and turn the other three knobs to halfway position. Then press the metal lever down and the tape will play back.



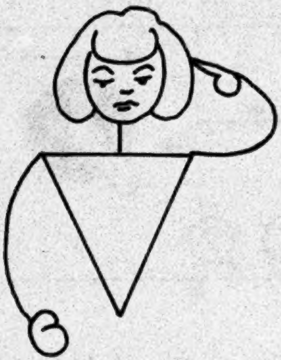
After using the tape recorder press the metal lever and release it. Switch the recorder off and place the lid over it.

APPENDIX K

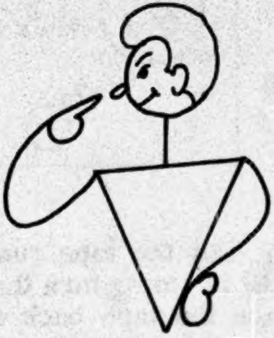
Example of the way in which lessons as set out in the "New Ship" pupils' book were set out in the handbook by Mr. Enoch Shamatutu

Lesson 33.

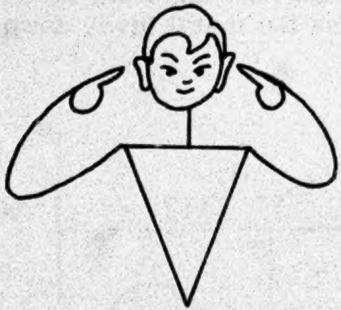
A. "New Ship English" pupils' book.



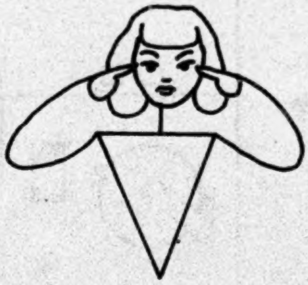
She is pointing to
her hair.



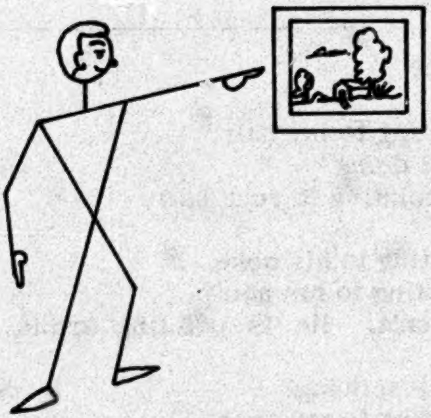
He is pointing to
his nose.



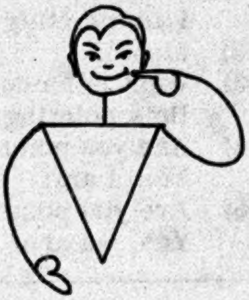
He is pointing to
his ears.



She is pointing to
her eyes.



What is he pointing to?



What is Ted pointing to?

B. Handbook by Mr. Shamatutu.

Objects: hair, nose, eyes, ears,
Sentence pattern, pointing to

---

1) Pointing to
2) Hair
3) I am pointing to my hair.
4) What am I doing?
You are pointing to your hair.
5) Nose
6) He's pointing to his nose.
7) Is he pointing to his hair?
No, he isn't. He is pointing to his nose.
8) Eyes.
9) What are you doing?
I am pointing to my eyes.
10) Ears.
11) What are you doing?
I am pointing to my ears.
12) Mouth.
13) What is he doing?
He's pointing to his mouth.
14) Are you pointing to your mouth?
Yes, I am.
15) Are you pointing to your eyes?
Yes, we are.

---

1. (a) Introduce new words as before.

(b) Oral work. Ask a pupil to point to his eyes. Then say, 'He is pointing to his eyes.' Ask, 'What is he doing?' 'He is pointing to his eyes.' Take a female, and ask her to point to her hair. Ask, 'What is she doing?' 'She is pointing to her hair.' Practise as much as possible with all the new words.

(c) Using the sentence cards, proceed as above. Pupils ask questions and others answer.

2. Read Lesson 33 in the book.

3. Do exercise 27 in the workbook.

APPENDIX L

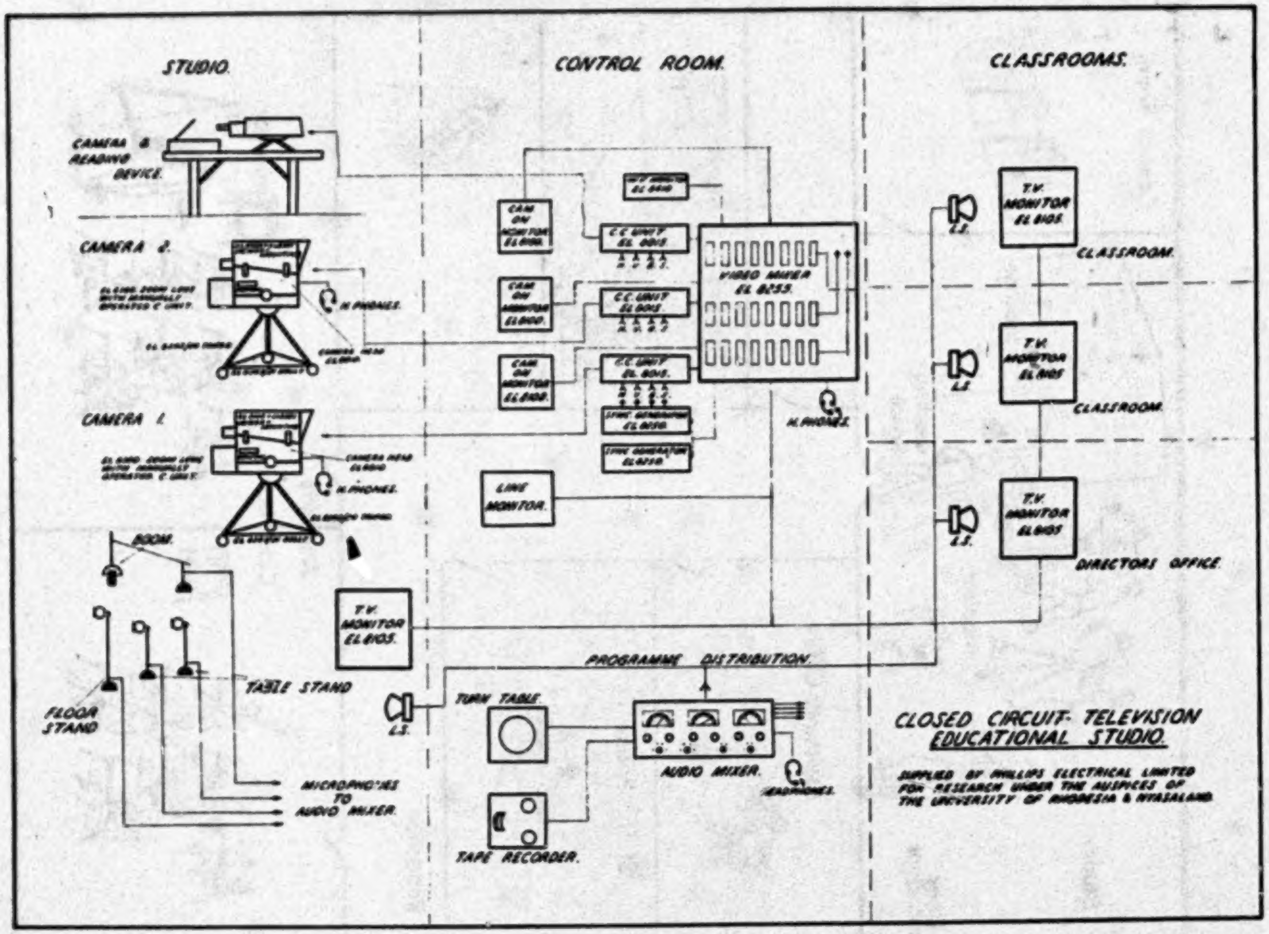
AN EXAMPLE OF A SHOTLIST FOR AN ENGLISH LESSON

1.	Cam 3	Opening cards.
2.	Cam 2	Presenter - breathing exercise.
3.	Cam 1	Presenter's hands.
4.	Cam 1	Presenter.
5.	Cam 2	Basket on the desk.
6.	Cam 3	a) A basket. b) What is this? It's a basket.
7.	Cam 2	A button on the presenter's coat.
8.	Cam 3	a) A button. b) What's this? It's a button.
9.	Cam 2	A table on the desk.
10.	Cam 3	a) A table b) Tables. c) What are these? They're tables.
11.	Cam 2	Stones on the floor.
12.	Cam 3	a) Stones. b) What are those? They're stones.
13.	Cam 2	Presenter.
14.	Cam 3	Workbook - Exercise 8.
15.	Cam 1	Objects.
16.	Cam 3	End cards.

APPENDIX M

AN EXAMPLE OF A SHOTLIST FOR AN ARITHMETIC LESSON

1.	Cam 3	Opening cards.
2.	Cam 1	Presenter : Greeting and introduction.
3.	Cam 2	Clockface.
4.	Cam 1	Presenter.
5.	Cam 2	Presenter.
6.	Cam 1	Big Board.
7.	Cam 3	There are seven girls in a netball team. How many girls in 5 teams?
8.	Cam 1	Big Board.
9.	Cam 2	Netball team.
10.	Cam 3	I give each man 5 hens, How many hens do I give to 5 men?
11.	Cam 2	Picture of hens.
12.	Cam 3	Each man gets 5 loaves of brown bread. How many loaves do 11 men get?
13.	Cam 2	Presenter and five loaves of brown bread.
14.	Cam 3	Zambia Arithmetic Workbook Ex. 4 & 5.
15.	Cam 1	Objects.
16.	Cam 3	End Cards.


STUDIO.
CONTROL ROOM.
CLASSROOMS.
CAMERA & READING DEVICE.
CAMERA 2.
H. PHONES.
CAMERA 1.
CAMERA HEAD
H. PHONES.
BOOM.
TABLE STAND
FLOOR STAND
MICROPHONES TO AUDIO MIXER.
T.V. MONITOR EL 8105.
CAM ON MONITOR EL 8100.
CAM ON MONITOR EL 8100.
CAM ON MONITOR EL 8100.
C.C. UNIT EL 8015.
C.C. UNIT EL 8015.
C.C. UNIT EL 8015.
SYNC GENERATOR EL 8250.
SYNC GENERATOR EL 8250.
LINE MONITOR.
VIDEO MIXER EL 8253.
H. PHONES.
PROGRAMME DISTRIBUTION.
L.S.
TURN TABLE.
TAPE RECORDER.
AUDIO MIXER.
HEADPHONES.
L.S.
T.V. MONITOR EL 8105.
CLASSROOM.
L.S.
T.V. MONITOR EL 8105.
CLASSROOM.
L.S.
T.V. MONITOR EL 8105.
DIRECTORS OFFICE.

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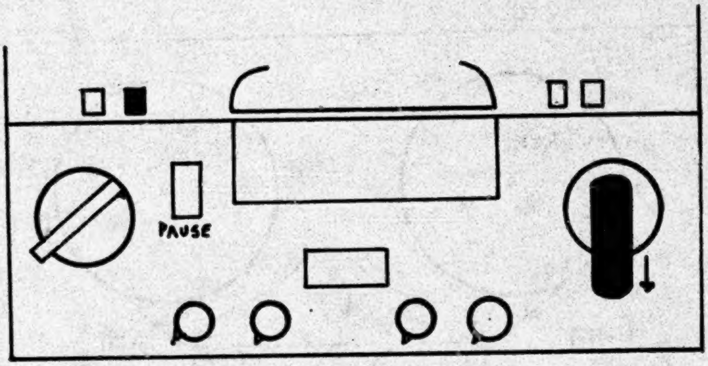
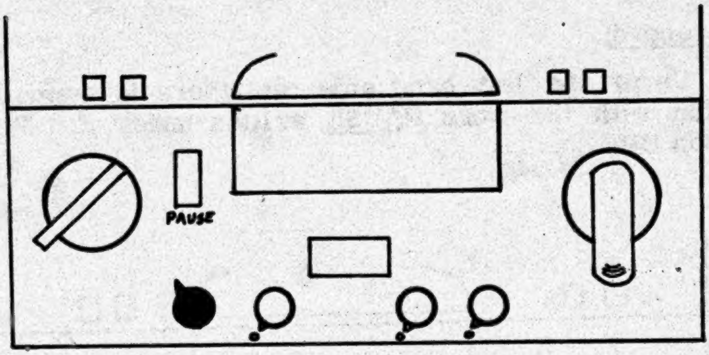
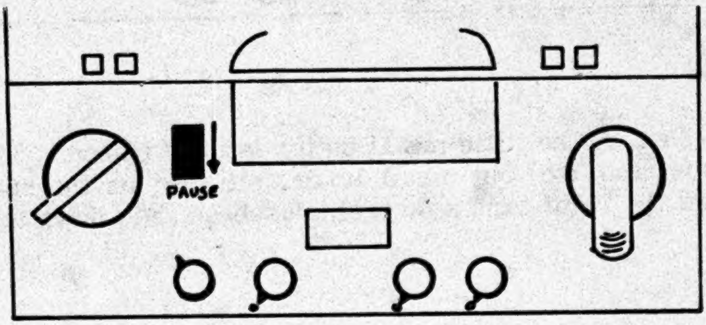
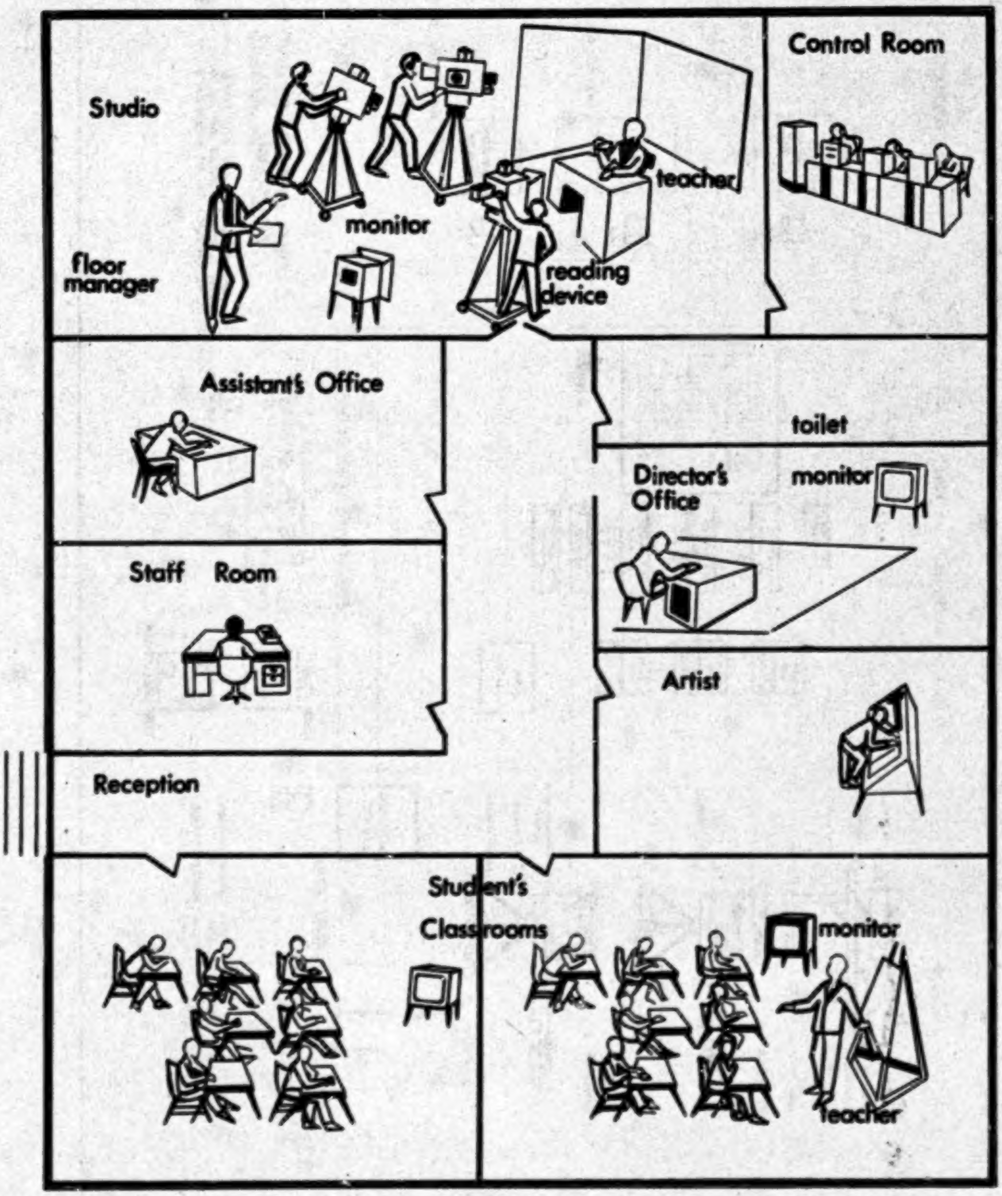


Right at the bottom are four knobs. Turn the first knob up to the No. 2 mark. Turn all the others down to O.



Now we are ready to record. As soon as transmission starts, push the little metal button DOWN and the tape recorder will record.




Studio
Control Room
teacher
monitor
floor manager
reading device
Assistant's Office
toilet
Director's Office
monitor
Staff Room
Artist
Reception
Student's Classrooms
monitor
teacher